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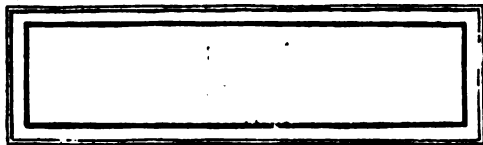
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**ECONOMICS OF
CONTRACTING**



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THE ECONOMICS OF CONTRACTING

A Treatise for Contractors, Engineers, Manufacturers,
Superintendents and Foremen Engaged in
Engineering Contracting Work

VOL. II

BY DANIEL J. HAUER
Construction Economist
Consulting Engineer
Editor of THE CONTRACTOR

UNIV. OF
CALIFORNIA

PUBLISHED BY E. H. BAUMGARTNER
Rand McNally Bldg., Chicago, Illinois, 1915

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TO VINU
ABROSLIO

*"Contracting broadens a man as does no other profession."
—Major Richard M. Venable of Baltimore, Md.*

*This volume is dedicated by the author to one
who, though, personally unknown to him, yet has by
his labors, integrity and high personal standing, as-
sisted in placing contracting on a higher level.*

*To J. Gilbert White
of New York City.*

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PREFACE

THE reception accorded the first volume of *THE ECONOMICS OF CONTRACTING* has been so flattering, as to its extensive sale, kind words written of its worth, and requests from numerous readers that more be written on this important subject, that the author has deemed it expedient to offer Volume II to the public.

Volume I remains unchanged, but in this new book many new subjects of interest to contractors are treated. These pertain both to the field and to the office. Other subjects, that were but little more than mentioned or only slightly discussed in Volume I, have been enlarged upon in this volume, at the request of readers. Thus in Volume I, Chapter IV, *Estimating by Guessing and Estimating by Analysis* are but little more than mentioned, while in Volume II, Chapter I, these same subjects have been discussed at considerable length.

Thus the reader may find some repetition, yet if he studies both books carefully he will see that new subjects are added and old ones are so treated as to be of greater value. The author hopes to remedy these slight defects if it is found necessary to issue a second edition of these books.

The author and publisher will both feel under obligations to those readers who may desire to point out errors, suggest improvements or make requests for additional information on contracting. Advancement along any line is so rapid today that an author feels his inability to keep abreast of the times, except by the assistance of his readers.

Two things have been demonstrated by Volume I: first, that contracting is a profession; second, that contracting can be written about so that the experience gained by one can be helpful to others.

Perry, Maine, 1915.

DANIEL J. HAUER.

TABLE OF CONTENTS

| | |
|---|------------|
| CHAPTER I.—Estimating and Bidding Upon Contracts | 11 |
| Estimating by Guessing—Essentials of a Cost-Keeping System—Estimating by Analysis—Estimating Forms—Errors in Estimating—Opportunities for Bidding—The Human Element in Bidding—Bidding on Private Contracts—Bidding on Public Contracts. | |
| CHAPTER II.—Making Contracts and Obtaining Bonds..... | 24 |
| Conditions Preliminary to Signing—Private Contracts—Public Contracts—Signing Contracts—Modification of Contracts After Signing—Changes in Specifications—Contracts with Sub-Contractors—Breaches of Contracts—Declaring Contracts Forfeited—Recording Contracts—Conforming to the Law—Obtaining Bonds—Personal Bondsmen—Bonding Companies—Kinds of Bonds—Guarantee Bonds—Bonding Brokers—Applying for Bonds—Other Kinds of Bonds. | |
| CHAPTER III.—The Financial End of Contracting..... | 44 |
| Financial Standing of Owners Promoting Engineering Projects—How Promoting Is Done—Promoting Improvements and Extensions—Dealing with Promoters—Accepting Bonds for Payments—Capital Needed for Contracting—Individuals and Stock Companies—Good Credit an Asset—The Individual Handling Finances—Maintaining Credit in Contracting—Borrowing Money—Confidence Versus Credit—Overbuying Goods—Preferring Creditors—The Need of Bookkeeping—Hints on Buying—Discounting Bills—Preventing Bankruptcy—Mistakes of a Beginner—An Expensive Office—Making Profits Vanish—Amount of Cash Capital Needed—Purchasing Tools and Machinery—Purchasing Construction Materials—Purchasing Supplies—Paying Labor—Office Expenses—Paying Freight—Incidental Expenses—Examples Showing Capital Needed—Banking Arrangements. | |
| CHAPTER IV.—Preventing Law Suits and Legal Aspects of Contracts | 103 |
| Attorneys' Services—Expert Engineers as Consultants—Keeping Diaries—The Care of Documentary Evidence—Co-Operation with Bondsmen—A Contractor's Agent—Keep Your Own House in Order—Time Limits and Extensions—Changes in Plans—Breaches of Contracts—Conforming to the Law. | |
| CHAPTER V.—Planning Construction Jobs..... | 116 |
| Visiting the Job—Sub-Letting Work—Planning the Work—Plant Layout—Time and Progress Schedules—Financial Arrangements—How to Start a Railroad Job—Starting a Street Paving Contract—Wagon Road Construction—How to Start a Sidewalk Contract—How to start the Erection of a Building—How to Plan a Concrete Bridge Job—How to Plan a Masonry Dam Job—Constructing an Ordinary Reservoir—Planning Sewers and Water Pipe Laying—Starting Canal Construction—Starting an Aqueduct Job. | |

CHAPTER VI.—Handling and Training Men.....170

The Labor Problem—The Human Factor—The Dignity of Labor—Classes of Laborers—The Present Condition—The Remedy—The Open Shop—Contractors and Their Workmen—Past Abuses of Workmen—Lawless Camps—The Liquor Evil—The Roaming Habit—The Effects of Abusing Men—Employing Workmen—Using Labor Agents—Order in Camp—The Drinking Evil—Running Commissaries—Defrauding Men—The Floating Laborer—Interest in Workmen—Making Money Off Contractor's Employees—Controlling Men—Handling Men—Winning Men Against Their Will—Training Managers—The Superintendent and General Manager.

CHAPTER VII.—Office Filing Systems.....231

Records to Be Filed—Various Filing Systems—The Basis of Filing—Filing Letters—Directions for Letter Writing—Filing Invoices and Statements—Filing Vouchers and Receipts—Voucher Forms and Their Use—Filing Estimates—Filing Maps and Plans—Filing Contracts and Specifications—Filing Daily Reports—Filing Progress Reports—Filing Cost Keeping Forms—Filing Record Books—The Use of Catalogues—Filing Catalogues—Filing Photographs—A Library as an Asset—Indexing Articles in Papers—Filing Articles in Papers—Filing Newspaper Clippings.

CHAPTER VIII.—Organization of a Construction Company275

Organizing a Company—Name—Incorporation Papers—By-Laws—Officers—Seal of the Corporation—Capital—Working Capital or Surplus—Stock Books—Shares of Stock—Stockholders' Meetings—Directors' Meetings—Responsibility of Directors and Officers—Legal Aspects—Registration in Home States—In Foreign States and Countries—Income and Tax Reports—Other Features.

CHAPTER IX.—Lines of Contracting and Specialization.290

Different Kinds of Contracting—Architectural and Engineering Contracting—Starting Contracting—General Contracting—Sub-Contractors—Two Companies Taking Contracts—Parent Companies and Subsidiary Companies—Size of Contracts—Contracting, Financing and Operating—Various Lines of Contracting—Specialization.

CHAPTER X.—The Standing of Contractors.....311

Contractors in Bad Repute—Their Relation to the Public—Their Relation to Public Officials—To Private Parties—To the Engineer of the Undertaking—Their Relation to Merchants and Manufacturers—Injuries to the Profession—Day Labor Work Versus Contracting—Contractors as Experts—Contractors' Associations—Contractors Should Stand Together.

APPENDIX A325

By-Laws for a Construction Company.

THE ECONOMICS OF CONTRACTING

CHAPTER I.

ESTIMATING AND BIDDING UPON CONTRACTS.

BIDDING on contracts is not all estimating, as all experienced contractors know. For estimating in order to make proposals, hard and fast rules can be laid down; but even close estimating does not always land jobs, especially when they are not public ones and need not be given to the lowest responsible bidder. Bidding is a many-sided game, and to some extent can be mastered only by experience, but some advice based on considerable experience may be found both useful and valuable to young and old contractors alike.

Estimating by Guessing.

Only a decade or two ago, few contractors put pencil to paper in order to estimate the cost of proposed work. Their estimating was almost entirely a mental process. Few would admit it was guessing pure and simple, for they maintained that they knew certain work could be done at given prices, while if they were guessing they would not know. The proof that their estimates were guesses is shown in the fact that they themselves considered contracting a gamble and lost money as often, if not oftener than they made it.

In many cases contractors hardly visited the proposed work, but took the engineer's word for the conditions and made up an estimate from plans, profiles and other data furnished them. If they lost money, the contractors then attempted to fix the blame on the engineer, and there were cases in which suits were brought by contractors for being deceived. This made engineers stipulate in their proposal sheets and contracts that contractors must visit the

proposed work and verify all facts for themselves. The author has had contractors take jobs on information furnished by him, without visiting the work.

In other cases, contractors have looked at new jobs from the rear of a fast moving train, or have driven along a wagon road near the proposed work, or taken a hasty horseback ride over the country, seldom stopping long enough to learn anything about the nature of the soil, the local conditions, the supplies of materials and many other items that would enter into the cost of the proposed work.

Even contractors who walked over the site of the work seldom took any notes or made memoranda of the conditions they found. For such things they depended upon their memories. If the engineer accompanied the contractor, the latter looked upon the trip as a sort of pleasure excursion, during which he was "getting next" to the engineer. If the engineer attempted to point out things that would be of benefit to the contractor in making an estimate, the contractor as a rule would head him off, attempting to make the engineer think that none of these things were escaping his notice, and that he was such an expert in his line that the engineer would want him to do this particular job.

The process of fixing a price consisted of deciding that the excavation could be done cheaper than on the last job taken, or that it would cost a little more than the Tennessee contract, while the stone question for concrete was a serious one, so that the price for concrete should be high. After some discussion, and asking a partner or a superintendent, "What prices would you set?" a price for each class of work was guessed at and placed on the proposal sheet.

Other contractors kept records of prices for which various kinds of work were let and attempted to apply these to new jobs. This was certainly guessing. The author once attempted this for some wagon road construction, but encountered so many difficulties before he was able to discover a price that would suit his job that he gave this method of estimating up in disgust.

Another method that came into use after contractors began to keep some cost records was the application of these costs as a total to new work. That is, the costs were not analyzed, but the contractor or his engineer sized up the new work according to the general conditions seen, and by a guess attempted to set a price for it.

As another evidence that most contractors' estimates were

guesses, many of them would not read over the specifications, stating, "They are all pretty much the same, and to read one is know them all." Then, too, many contractors would not secure quotations for the various materials they would need until the job had been landed, so that their estimates both for labor and materials were guesses. The author recalls how he landed one job, on which a large amount of timber had to be used, by obtaining quotations for each class of timber required. The prices so obtained were low ones, allowing low figures to be named on the job. Another contractor, who was the next lowest bidder, stated in a conversation that prices on timber in that state were pretty much the same, and as he was continually purchasing timber he did not need quotations. Upon being asked the prices he last paid in another part of the state, he named some, all of which were much higher than the quotations obtained by the author. This contractor lost a good job by guessing at the price of timber.

Unless cost records are kept in detail and properly analyzed each day, estimates made up from them are to a great extent guesses. This will, however, ultimately lead to estimating by analysis.

There is no uniformity among engineers and contractors in making up estimates of cost for construction work. Each man follows, to a great extent, his own ideas, feeling that he is using the best method. Thus each has his own system, which is one reason why prices vary so much in proposals made on the same job by different contractors. Though the factor of personal judgment will always show in making up estimates, it now enters into this work much more than it should, as estimating is susceptible of being made, and should be made, a more exact science.

As evidence of this, the author has seen several men following the same method make up estimates of cost that agreed very closely, within a few per cent, this difference being due to the personal judgment as to details. These results could not have been obtained by widely different methods.

Low prices should not be made by close estimating, for this means a possible loss of money; but low prices should be made by liberal estimating and by improved methods of doing work and the installation of the best types of labor-saving machines.

The great desideratum of any estimating system is accuracy. To obtain work by public bidding, prices must be low; but there

must be a reasonable profit in them, and to insure this they must be accurate. This cannot be obtained by loose systems of estimating; it can be secured by a well thought-out system, one that takes into consideration every factor, all the conditions, and leaves nothing to be guessed at, nor to be covered by the so-called item of contingencies. Furthermore, each unit of work must be broken up into the smallest details possible, so that the estimate deals with small rather than large units. The value of this can readily be understood by an illustration. If the price on one unit is one dollar, and an error is made of ten per cent, the work may be done at a loss; but if this unit is broken up into ten or more items, then, if a mistake is made on any item, the total error will hardly amount to more than a cent, which would not materially affect the work.

These general remarks should be elucidated, and given more in detail. First, however, it is necessary to take up the subject that leads to scientific estimating, and that is cost-keeping. During the past five years cost-keeping has been discussed pro and con, but even those who have argued against it make some pretense at keeping costs. Estimating is dependent upon cost-keeping. Without cost-keeping, estimating, unless based on cost figures kept by others, will be but little more than guessing.

Essentials of a Cost-Keeping System.

If cost-keeping is done in lump sums then the estimating based upon such costs must be in lump sums. This shows the necessity of keeping detailed costs, and even then, if the cost records are to be of value they must be assembled and analyzed. If enough information is given with costs, any such records can be analyzed, even printed costs data; but one great defect of most costs, both printed and unprinted, is that not enough details are given to admit of analysis. Cost data that cannot be analyzed have little value, save for being used as checks on estimates, and even for this purpose their value is questionable.

Cost data should be kept in great detail for two excellent reasons. One is to locate wastes and excessive costs and by comparisons know them, and thus eliminate them promptly. The other is to have such details of costs that estimates can be made up in the same detail. The two should be bound together, and the two systems should be based one upon the other. This is not a new theory, but

unfortunately few contractors and engineers see the connection between the two systems; consequently most cost-keeping systems are not devised to give much assistance in estimating.

For instance, a cost record shows that on some pick and shovel work, on which men were paid \$1.50 per day and teams \$3.50, the cost of excavating was 30 cents per cubic yard. A similar job in the same material is to be done, but wages are to be \$2.00 for men and \$5.00 for teams, the other costs remaining the same. Now, how is an estimate to be made up from these records? It can only be proportioned, and the results so obtained will be uncertain.

But if the costs are kept in detail and it is shown by the records that a man picking loosened 22 yards in a day, while a man shoveled 12 yards, and each team hauled 58 yards, then it is an easy matter to figure the increased cost and definitely fix it at 40 cents per cubic yard, to which must be added the desired profit. Cost-keeping should not be a mere collection of figures of dollars and cents; it must include many other records, weather, local conditions, prices of materials, unusual conditions that may arise and many other items that may affect the cost, such as plans, profiles and other drawings.

Cost keeping systems should not grow, but should be devised for certain specific purposes. With use, a well devised system can be improved upon and made to serve its purpose better, but an unintelligent and cumbersome system, or an incomplete one, cannot grow into a satisfactory one. It must be discarded, and with the knowledge gained from the old system, a new one must be devised.

To devise a satisfactory and complete system, one must clearly understand what cost keeping is, its use and the objects of cost data.

Cost keeping is really bookkeeping, being an accounting of a contractor with his own employes, his machines, and the materials and supplies purchased by him. Names of individuals need not be known, but the classes of work must be known. Cost keeping can be made an integral part of a regular bookkeeping system, each day's cost records being entered in the regular ledger, it can be made supplemental to bookkeeping, only monthly totals being entered in the ledger, or it can be made entirely independent of bookkeeping.

The author believes that cost keeping should be only supplemental to bookkeeping, that only the general results should be car-

ried into the regular ledger, and that for all details the cost keeping records must be consulted.

In devising cost keeping systems, a contractor must exercise care that the labor of keeping the costs is not excessive. If extra men must be employed to keep costs, then the system is cumbersome; the money saved through cost keeping will be in part wasted by those employed to keep the records. On small and limited jobs the clerks and others already employed can keep these records. Material clerks, bookkeepers, timekeepers, superintendents, foremen and even intelligent workmen and mechanics can fill out the prepared forms.

On large jobs the same method can be pursued; but if a contractor has a number of large jobs, it may be advisable to have a man in charge of the cost keeping. For the head, a cost analysis engineer should be employed—one experienced in keeping costs and especially in analyzing them. If a man is needed on each job, a number of cheaper men can be employed to work under the cost analysis engineer and follow his instructions. At all times there should be a man at the head of the cost keeping responsible for having the reports made daily, and for seeing that blanks are issued for this purpose and that when the reports reach the office they are footed, analyzed and entered in the cost record books. Without a head to the system the records are not likely to be kept up-to-date, as the clerks and foreman will take every opportunity to evade this task, for many of them look upon it as extra work that does not belong to their positions.

Where the business justifies it, the forms or blanks for keeping daily costs should be printed; but for smaller jobs where only a few forms are used, they can be made in the contractor's office on some kind of a manifolding machine. Such a machine is always useful to a contractor, as it can be used for many purposes. When the author has used printed forms, he has made it a practice, when he first devised a new form, to have a number of copies made on some manifolding device, so as to try out the form with the idea of making corrections and additions before having it printed. Good results were obtained in this manner.

When forms for cost keeping are printed, all the forms should be numbered on some well thought-out system. It is often easier to refer to cost keeping blanks by a form number than it is by name, for at times several forms will have similar names, causing

confusion. With the form number, the date of printing should be put down and the number printed. Thus "Form No. 1, 6-10-13, 2,000," means that this form was printed on June 10, 1913, 2,000 copies being made. This is a check on waste of forms and gives some idea of the number needed at a new printing.

One or two forms do not make a cost keeping system. Each class of work should be recorded by itself, and if it is done with the proper detail it cannot be done on one form or two. A system that does not provide for the proper analysis, nor for making a permanent record for easy reference, is not a complete system. The analysis of costs is as essential as the keeping of costs.

Cost keeping forms can be of two kinds: forms printed with the kind of information desired on the job, with blanks left so that the daily records can be entered; and cards or forms with probable amounts of work printed on them, meant to be punched with a conductor's punch to show the amount of work done.

The first kind is in more general use and for most purposes is to be preferred. For time records, and for work on which men must dirty their hands yet make frequent records of work done, the punch card is better; for even if the cards become so dirty that they cannot be read, they can be placed over a clean card and the punched record read from the clean card. A punch card can also be used when men are poor writers, and only a few records are to be made. Thus, the number of bags of cement used in a day can be kept on a card punched by the men handling cement.

A cost keeping system should be so devised that results can be read from it quickly. If it takes hours to be able to tell the cost of any unit of work, a contractor or his superintendent will soon tire of costs kept in this way and will give up using them. The busy contractor should be able to tell at a glance what the cost has been for every class of work each day. Many contractors now using costs complain that they must spend too much time in seeing what work has been done daily and how much it has cost.

For this reason some contractors do not keep costs, but only records of work done. With approximately the same forces they feel that this gives them the necessary information. Other contractors keep such records as to show the man or machine unit of work done daily. This is an improvement, but it is not a permanent record of value. The costs are essential, because they cover both labor and materials, while the other covers only the

labor. There are times on every job when materials, as well as labor, are wasted. If only units of work done are recorded, it is not possible to compare the daily records with the estimated costs. Cost records are more valuable than any other records, if they are made complete.

A cost keeping system should include a standard for daily comparison, so that it can be seen if the work is being done at a reasonable cost. It is too late to know this at the end of a month or the end of a job. The best standard for such a comparison is the estimated cost of the work made in obtaining the job. A comparison made daily with such a standard will give quick results, and allow changes to be made at once.

The system should also show the amount of work done daily. This should, as far as possible, be checked by several reports, and at the end of the month the amount of work so reported can be footed up and compared with the engineer's monthly estimate.

A cost keeping system should also be a check on the honesty of employees. Thus one man's report is a check on another's, and materials and tools can be accounted for in the same way. Without such check a man can show low costs when he is doing work in an extravagant manner.

Cost forms should also admit of easy filing so that they can be filed at a low cost and be referred to without loss of time. To do this they should be, as far as possible, of uniform size. After a standard size has been determined upon, blanks which must necessarily vary from it can be made twice the standard size, or half the standard size. These should all be of such size and shape as to admit of being mailed in a large commercial envelope without folding, or with not more than one fold. The forms should be printed on light cardboard of such a grade as to admit of writing on it with pencil or ink. The size should be such as to make it inconvenient for a man to carry them in his pocket, so he cannot forget them, but will be glad to turn them in to the office each night.

A place should always be arranged on the form for men to sign their reports. This makes them more careful and accurate and makes them assume the responsibility for the correctness of their reports.

The principles of all cost keeping should be to amass cost data that can be used for future estimating, to systematize work,

showing the best methods, and to allow of the elimination each day of waste of both labor and materials.

The items of cost keeping consist of labor, teams, materials, supplies, plant and general expenses. Labor is divided into a number of items, dependent to a great extent upon the wages paid. Thus there is the foreman cost, that of mechanics, machine runners, artisans and the different grades of common laborers, based on the wages paid. Then, too, the men are often arranged as to the class of work they are doing—men shoveling being differentiated from those picking.

Teams are accounted for as to whether they are hired or not, unless an artificial price is set upon them, when they are all put down at the price of hired ones. Then a difference is made as to the number of horses used in a team—as one horse, two horses, and so forth.

Under the head of materials are all things that enter into the construction and are paid for in the prices under the contract, or are used for the work and have a salvage value at the end of the job. In the first class, we have cement, sand, stone, steel, pipe and other things, while in the second class come concrete forms and scaffolds.

Supplies are all kinds of materials that are used on the work and are paid for only indirectly, such as oil, coal, gasoline, explosives and nails.

Under plant come all tools and machines. The small tool, likely to be used up on the job, is a direct charge, while machines can only be an approximate charge, covering repairs and depreciation, with interest on the investment, unless the machines are rented, when the rental is a direct charge.

The general expenses are the overhead charges, covering superintendence, the cost of obtaining work, office expenses, insurance, and many other items.

All of these costs should be so kept as to be divided over units of work done daily. The unit costs are those desired, and to obtain them there must be some method of measuring up the work daily or of keeping records of carloads, wagon loads and so forth.

Different forms should be devised to obtain records of these various component costs. Thus, one form should show the various labor items, the teams and supplies; a second form should be used for the materials. If only a few materials are used and their cost

is insignificant, they can be included in the labor form; but if there are many of them and the cost runs quickly into a considerable amount of money, then better results can be obtained by having a separate form. There should be one form to show materials received, so that they can be checked against the invoices in the office, and another form to show the materials used. When supplies also amount to a great deal of money, it is well to have a separate form for them, as in the case of explosives.

The plant and the general expense costs are not made up in the field, but in the office. These costs should not be allowed to leave the office, so that the foremen and others cannot learn them.

Some of the costs should be confidential, and by this method they will remain so. Foremen and others keeping costs in the field will learn little of the actual costs of work being done with a system devised in this manner, so that they cannot carry one contractor's costs to another. They can take with them only some details that may be misleading rather than helpful.

For other information as to cost keeping, the value of cost data, cost analysis, how specifications affect costs, factors of cost, comparative costs and making public cost records, the reader is referred to Volume I, Chapter V.

Estimating by Analysis.

Estimating is like working cost keeping backwards. Sheets of paper should be prepared for it or regular printed forms used. These form a permanent record, to be used frequently if the job is secured, and to be used in checking future estimates whether the job is obtained or not. Space should be left on the first sheet to show if the job was obtained, and if not, to give the reason. Then the location and character of the work should be shown and who made up the estimate and checked it, with the date of submitting. The scale of wages used in making up the estimate should be set down, followed by a list of prices previously obtained from dealers and manufacturers on all the materials that are likely to be used. Such prices should include the freight and hauling to the job. In addition to the materials, prices should also be obtained on the supplies needed, such as coal, explosives, oils and many other things.

In addition to this information, the estimate sheet should have written on it, or attached to it, provisions of the specifications

that may affect the cost, plans and sketches showing the unusual features of structures, and for concrete and similar work, sketches showing the general features of forms on which the estimate was based. These things may not seem very important at the time, but if the job is secured they may be needed frequently, and even if the work is not obtained, the value of the estimate for future use in estimating is small, unless reference can be made to these data. ✓

All of this, like going over the plans and specifications, and visiting the job, is work preliminary to the making of the estimate. The figuring commences after all of this is done. It is not necessary to keep the scratch pad pages on which the additions and multiplications are made, but space should be supplied to put down all the results, so that they can be checked, and used for future reference.

The detail of the estimate can be illustrated by an example. Thus for earth excavation there is the foreman cost, the cost of loosening the earth and that of loading it, the cost of transporting and of dumping. Then to these are added any extra costs of men or materials, and plant charges and general expenses. This analysis is suitable for any method of excavation. For hand work the picking comes under the head of loosening, the loading as shoveling, the transporting covers the teams, while with scraper work the plowing comes under the head of loosening, the loading consists of the men holding the scrapers and the snatch team, and the transporting of the team and its driver. The dumping is the cost of the men on the dump. This same distinction can be carried into machine excavation, as the loosening can cover any blasting necessary; if none is done then the loosening and loading is combined and covers the work of the power excavator, the transporting, the cars, wagons or other vehicles used; while the dumping covers the men on the dump, the cost of trestles and any other items coming under this head.

With all of these items considered and all listed on the estimate sheet, no detail of the work is likely to be overlooked, and each item can be estimated by itself. Even if the estimate is more or less a guess, it is more easily made. For instance, in steam shovel work the crew for the entire job can be estimated, and a guess can be made that the shovel will excavate 600 cubic yards in a day, and thus each item of cost can be worked out on a cubic

yard basis. If cost records, kept on this same system, are available, these detail costs can be worked out without any guessing, only judgment being needed to adapt costs of other work to the new. This shows the necessity, in keeping costs, of setting down many features and conditions that affect the costs, so that the estimator need not depend upon his memory to avoid being misled. This will take out of estimating another element of chance.

It is necessary on some classes of work to estimate the costs in one unit of work and convert it into another unit. Thus for concrete pavements the price is generally in square yards, while it is easier to estimate the cost in cubic yards, and then by taking the thickness of the laid concrete, convert it into a square yard price. This is also the case for form work for concrete structures. A system of forms can be sketched out and attached to the estimate sheet. From this the amount of lumber needed for the entire work can be figured. This will be in thousand feet board measure. Then the cost per thousand feet can be estimated from other records for forms, to which the cost per thousand for erecting forms and tearing them down can be added, thus giving the entire cost for form work for the job. Then, by dividing this sum by the number of cubic yards, the estimator obtains the cost per cubic yard for forms. This is all shown on the estimate sheet. If the work is not done according to these figures, then either the work or the estimate is wrong and the matter should be righted before another job is undertaken.

Estimating Forms.

For making up an estimate for concrete, several forms may be necessary. Thus, to obtain the estimate per cubic yard the following items are listed:

| | | |
|--------------------------------|------------|---------|
| Cement..... | bbls. ⑦ | \$..... |
| Aggregate..... | cu. yd. ⑦ | ..... |
| Sand..... | cu. yds. ⑦ | ..... |
| Forms ..... |  | ..... |
| Steel..... | lbs. ⑦ | ..... |
| Labor on Steel ..... |  | ..... |
| Labor, Including Foreman ..... |  | ..... |
| Water ..... |  | ..... |
| Plant ..... |  | ..... |
| General Expense ..... |  | ..... |
| Profit ..... |  | ..... |

On a separate sheet the forms are worked up, including materials, such as lumber, nails, wire, oil; labor of framing, labor of erecting and tearing down, hauling and other items. It is some-

times necessary to make a separate form for the labor item. From such forms as the above the cost per lineal foot of a completed structure can be figured, if a cubic yard price is not desired, or it can be transformed to any other unit. This transforming of prices should be done on the estimate sheet or form, so that the record is complete. It may be weeks or months or even years before these sheets are used again and nothing should be left for memory, but everything should be so recorded that even a stranger could understand the figures and the method of arriving at the final estimate.

Sometimes there are special pieces of work that must be estimated on a form devised for that particular job. The estimator can devise this special form and attach it to the other sheets.

There are two ways of getting up estimate sheets. One is to use a sheet for each class of work, all kinds of excavation being placed on one sheet, all grades of concrete on another sheet, pipe work on a third, paving on a fourth and so on through the entire list. Forms for such sheets are more easily devised, and all of the same kind of work can be kept together; but for any large job embracing many different kinds of work, a large number of sheets must be used. This is expensive, as sometime a single sheet will have only one item on it.

For this reason the author prefers forms planned for different kinds of jobs, all the classes of work to be done being on one or two sheets, with a sheet for street paving, one for concrete structures, another for sewers and so on through the list of engineering construction. For most work only one sheet is used in addition to the first sheet giving the data upon which the estimate is based. This saves the waste of printed forms, keeps before the estimator all the classes of work upon which he must estimate and gives a complete estimate in a much more condensed form.

The prices are copied from these estimate sheets upon the proposal forms, and are submitted at the proper time. If changes in any of the prices are decided upon afterwards, before giving the proposal to the owner or his engineers the figures should be corrected on the estimate sheets so that an accurate record of the prices submitted, and how they are derived, is retained.

Errors in Estimating.

At times contractors make serious errors in getting up estimates or in submitting proposals. On private contracts without a

bidding bond or certified check put up by the contractor, the proposal can be rejected by the contractor and the owner can hold him to it only by a law suit. On public contracts, however, the bond or certified check is forfeited, or if the error makes the bid too high, the contract is lost.

Recently a contractor made an error of about \$100,000 in a bid of about \$400,000 and as the error was against him, he forfeited his \$10,000 certified check rather than undertake what would have been a money-losing job. Within the past year one firm of contractors bidding on some of the New York subways made some errors in their bid that prevented the firm from obtaining a valuable contract. The contractors brought an injunction suit to prevent the Public Service Commission for the First District of New York from awarding the contract to the lowest bidder.

There was a difference of \$216,112 in the bids of the two contracting firms, but it was claimed by the firm suing that two clerical errors made in their estimate would have made up this difference and \$53,000 in addition. The relief asked for was to allow the proposals to be corrected so that their bid would be the lowest, justifying the commission in awarding the contract to them.

The court took a common-sense view of the case, stating that relief could not be granted, as it would establish a precedent allowing bidders on public work to name unusually large prices for some items, with the hope that their total bid would be the lowest, when they would accept the contract, while if their bid proved to be high, they could claim that a mistake had been made and demand the right to correct their bid so as to be the lowest bidder. This seems to be a sane view of the letting of public contracts and illustrates in a striking manner the need of exercising great care in making up and submitting proposals.

The mistakes in this case consisted of naming a price of \$12.00 instead of 12 cents per pound for special wire forms and writing \$45.00 instead of 45 cents a lineal foot for galvanized iron pipe hand rails. These errors are of a character that one would suppose would have been detected before submitting the bid, but as they were not, it shows the necessity for using such forms for estimating that errors can not occur without being detected. This is not the first time that prices have been written in dollars when cents were intended; and the opposite mistake of naming

prices in cents instead of dollars has occurred, causing a contract to be awarded at too low a price.

Another class of mistakes sometimes made by contractors in making up estimates for proposals is in using the wrong unit of work. Some years ago a southern railroad, in asking for bids on some terminal work, had an item of cubic feet of brick masonry. Most of the contractors in that section were accustomed to such work being measured by the cubic yard, and several contractors named cubic yard prices on a proposal sheet that called for a cubic foot price.

Many classes of work are measured in different units. Brick-laying is one of these, as the cubic foot, cubic yard, and thousand of brick are all well-known measurements.

Still another chance of error is in paying for several classes of work under one item, such as pipe sewers, which are frequently paid for under the item of a lineal foot of completed sewer. Thus on a paved street there may be the tearing up of the pavement, the excavating and shoring of the trench, the pumping of water, the laying and calking of the pipe, the backfilling of the trench and replacing the pavement. To omit any one of these items may make the job a ruinous one.

If a contractor uses the method of estimating and the estimate sheets described in this chapter, the first thing he should do is to compare his sheets with the proposal form so as to see that the units of work are the same. If they are not, the estimate sheet should be changed at once.

If prices must be named on completed work, then the various units of work must be set forth on the estimate sheet so that not one item will be overlooked. To do this, it may be necessary to make up a set of special sheets, for the costs must first be estimated in units, then space must be left to divide up the units for the method of payment; for instance, in sewer work paid for by the lineal foot, the various units of work in each lineal foot must be worked out and the prices per unit set down in order to arrive at the total cost to fix the proposal price.

On all estimate sheets the columns should be unit ruled—that is, ruled to take single figures—in order to prevent mistakes; and for those columns meant for prices they should be subdivided to take cents and dollars. That is, a column should be divided giving a narrow column for each figure in cents. Thus, at a glance a

figure representing cubic yards can be told from one meant for money. Further, it is not possible to get the dollars and cents confused, nor to confuse a price or cost of one cent with ten cents, as is sometimes done, for even without the cipher, the figures will appear in different columns, see Fig. 1. This may seem like a

| NAME | NO. | RATE | | | | AMOUNT. | | | |
|------|---------|------|--|------|----|---------|--|------|--|
| | CU YDS. | \$ | | CTS. | \$ | | | CTS. | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |

Fig. 1. Showing Ruling to Denote Cubic Yards, Rates and Amounts, With Dollars and Cents Columns.

trivial matter, but the importance of it can be seen in the New York lawsuit. If the contracting firm in question had used such estimate sheets, with columns ruled in the manner described, there would have been no possibility of such a mistake.

For other data on estimates and estimating, the reader is referred to Volume I, Chapter IV.

Opportunities for Bidding.

Contracting jobs may be divided into two classes, for consideration as to bidding; namely, public contracts and private contracts. In the first must be included contracts for the national government, the various state governments, for counties, towns and cities, and the various public service commissions. Under private contracts come all those for corporations, such as railroads, mining companies, water companies, as well as those for individuals.

Different methods must be used in obtaining these different kinds of contracts. On private contracts there are various methods of first learning of proposed work. As the lettings of only a few

of such jobs are advertised, information must be obtained in other ways. A contractor can advertise himself, telling of the classes of work he does, and by photographs and descriptions show the various jobs he has executed. Few contractors advertise, as most of them believe it does not pay, but the author believes that many contractors engaged in private work would find it to their advantage to advertise in the proper mediums, if done with moderation and judgment.

With advertising or without, a great asset in obtaining contracts is a reputation for doing good, honest work and completing jobs on time. No matter where you work or how far away you go to take another contract your reputation will follow you, sooner or later. Then, too, one must use the work done in the past as references to obtain new work. See to it, therefore, that foremen and men do not slight their work; and do not earn a reputation as a contentious person. It is all right to protect yourself and stand up for your rights under the contracts and the law, but private corporations dislike to award contracts to men who are unwilling to conform to their wishes, or are continually entering into litigation. A little tact and diplomacy in such matters means to save money and win friends. Few officials will take advantage of one who is trying to please them. One of the most successful contractors in this country, who has carried on some of the most extensive contracts in the world, is proud of a record that he has never started a lawsuit. He is always willing to effect a compromise on disputed points.

These things are the best kind of advertising. One method of publicity of which most contractors do not avail themselves is the construction news columns of the technical papers. All such papers are glad to receive news items as to the letting of contracts and progress being made upon them.

If a contractor is bidding on a job he can send his own name and the names of others who may be bidding to the various papers. If the contract is awarded to him he can again send them this news item. If he sublets part, or all of the work, he may send the papers a list of these subcontractors and their addresses. During the life of the job, news items can be sent out describing the progress being made. Then if the contractor will have either an article written, illustrated with photographs descriptive of plans and methods used or will send photographs and notes from which articles can be

written, the papers will in most cases be glad to publish them, mentioning the name of the contractors. All of this serves to keep the contractor's name before the construction world.

Watch the construction news in the various papers and even when new companies are being formed or loans being arranged for, or work only planned, write letters, well worded, to one or more officials of the company, calling attention to work done and asking for a chance to bid. If jobs are about to be let, send a telegram as well as write, confirming it. Today, with night letters and day lettergrams, much telegraphing can be done at a low cost, and those receiving the messages will be pleased with this evidence of your push and with your hustling abilities. The author, by means of letters and telegrams, has secured the opportunity of bidding on a large number of jobs, many of which were landed.

Follow-up letters to keep in touch with prospective work is also a good method. For this, records should be kept of all possible work so that none will be overlooked. For this purpose, a small card index will be found useful, sample cards being shown in Figs. 2 and 3. The printing can be changed to suit the contractor.

Many railroad companies and other corporations keep lists of contractors, from which lists they invite bidding. Any responsible contractor can, as a rule, have his name placed on such lists, by giving references showing the work he has done, and his financial responsibility. A job once landed and done well will insure him plenty of chances to bid again.

The Human Element in Bidding.

With an opportunity afforded to bid, the real work of bidding commences. In Chapter V of this book some space is devoted to obtaining quotations on materials, so that subject need not be touched on here, but rather the general features of making a bid so as to land the work will be discussed, assuming that the contractor has made a close estimate of the cost of the work and has named fair prices, although they may not be the lowest.

If you are not personally acquainted with such officials as chief engineer and president, who have in charge the letting of the work, by all means, before leaving home make inquiries as to who they are, what they have done, and who among your acquaintances may know them.

In meeting the chief engineer, after introducing yourself and telling some little of your own work and what you are doing at

feel more than a passing interest in you. Such little snatches of conversation brought into other meetings, as to past work done by both, will open up a friendship. If possible comment favorably on his plans or specifications and ask his advice as a *practical* engineer on some method of doing work, saying that you have been undecided upon this question for some years.

This may seem like cheap talk, but it is the kind that counts, and any man will do more for anyone to whom he feels friendly than he will for one he does not feel he knows. Tell him of contracts you have finished on time or ahead of time and of good work you have done. If any of your jobs have been written up in the technical papers, by referring to his files or by copies you may have with you, call his attention to them. If these things do not land you the present job they will land one later.

Go over all or part of the work as soon as possible and then call on the president of the corporation. He will always be a difficult man to reach or see; therefore, to get to see him, one or more letters of introduction to him must be obtained, either from a personal friend or close business associate. - Such letters may be obtained before starting on the trip to bid, or else in the city or town itself. The contractor may not know personal friends of the president, but he may get letters of introduction to business associates of the president, who will furnish the necessary introduction. A little ingenuity will allow you to meet the president, even if it must be done at his residence.

Given the chance to talk, tell him in a business way of the jobs you have completed satisfactorily, of the plant and organization you have to do his job and in a general way how you propose to do it if you can secure the contract. Refer as much as possible to mutual acquaintances and, without boasting, give him to understand you are better equipped to do such work than most contractors operating in that section. If the president is an engineer you can talk in a manner similar to the way you have done to the chief engineer, while if he is a lawyer you can go into generalities stronger and possibly talk some politics. If he is a business or railroad man, risen from the ranks, the talk must be brief and more matter of fact. You are there to impress him with your ability to handle his construction, so that in case of the award being doubtful, he will throw his influence to you.

The author once secured an important contract over the lowest

bidder by impressing upon the president of the corporation the statement that so complete an organization was behind him that he could materially reduce the time set for completion by the engineer and was willing to make the job a bonus and forfeit one for completing on the date set, which was but little more than half the time set by the company.

Quick completion is always a good thing to talk about, but it must be backed up by a record for quick work; unless some penalty is named for noncompletion on time, it amounts to nothing, but it is always impressive. On the other hand, do not depend upon landing a job by naming a short time finish when you are asked to name your prices and also the time for completion. In very few cases will the shortest time land the contract unless the lowest prices are named with it, nor will the proper consideration be given to a reasonable time limit. Contracts are frequently awarded on low prices and to a contractor naming a quick finish, when with the outfit he proposes to use it is impossible to do it within the time named. The delay caused by him may cost more than the few thousand dollars saved by his prices.

Bidding on Private Contracts.

It is not enough merely to put in a bid and then go home; the bid should be followed up until the contract is awarded. If there are only a few days or a week intervening between the bidding and the award, and the trip home is a long one, the time should be spent on the ground. Information that will be valuable in conducting the work may be secured, other jobs going on in that neighborhood can be visited, and acquaintance can be made with material and supply men during this time. Each day some of the officials of the company can be visited and influence can be brought to bear on the board of directors or awarding board. You will be displaying an interest in the job and be present in case any explanation is necessary as to your bid or plans for doing the work. Sometimes you may be asked to shade a price. These things may mean the winning of the contract. If the job is worth bidding on, it is worth the extra time and money spent in following up the bid. If the interval between the bid and the award is some weeks, it may be well to go home, and return a short time before the award.

An important matter is to inquire into the financial standing of the owner of the work, but this should be done with care and

much judgment, and inquiries should never be made in the localities of the work or among the friends of the officials, nor at their banks, as the fact will probably be carried to them and this may prejudice them against you. At any rate it will not do you any good. Such inquiries should be made through the contractor's own banks, and through the mercantile agencies.

In bidding on contracts, as far as possible avoid the company of other contractors. Find out all you can about those who are bidding and keep your own presence a secret if you can. They are your competitors and the less they know about the things you are doing the better off you will be.

Bidding on Public Contracts.

But little that has been said applies to public contracts. If politics and graft control the letting, then money and influence will count, but few new contractors will be able to enter the field, and in most cases they will be just as well off if they do not try. If the lettings are fair ones, then the prices will count, except where the law does not make the award to the lowest bidder mandatory.

If the low bidder can be eliminated, personal influence, as set forth under private contracts, can be used in a subtle way to land jobs. The awarding officials will be able to find excuses for their actions, so the contractor need not worry.

On public contracts care must be exercised that nothing causes a proposal to be classed as informal. This can happen by a failure to put the prices on the proposal sheet and to follow out the order and conform to the instructions. If an alternate proposal is to be submitted, do not let it interfere in any way with the regular proposal. Make that formal, then on another sheet or by letter submit the alternate proposal. Thus no objection can be found with the regular bid, yet attention can be called to the change proposed.

Public bids are generally opened and read at a public meeting and a contractor should make it his business to be present. If in any way a bid made by a competitor is informal, call attention to it at once, especially if it seems to be a low bid. An awarding board has no right to accept an informal bid, for under the law it is not considered a bid, and the proper comparison cannot be made with other proposals. If any item is changed or a lump sum

named instead of a unit price, or vice versa, then the bid is informal.

Another matter of importance is the certified check or bidding bond that must accompany the bid. Read the instructions to bidders regarding these things and be careful to have them right in every particular. Your bid can be thrown out if your certified check is wrong or your bond is not right.

In making your bids, especially in a strange state, obtain a copy of the labor laws and employer's liability acts before bidding so as to see if these laws will affect your prices and the ordinary methods you are accustomed to follow on your work. A breach of the labor laws may mean that you cannot collect your estimates for work done. These things should be known before the bid is made.

The chance of showing your personality and ability is not given in bidding on public contracts as it is on private ones. The law must be followed, but the tendency today is to give awarding boards more discretion in such matters, meaning either an improvement over the present method or chance for a reign of graft.

Thus in some states the contract need not be awarded to the lowest bidder. If this is the case, then without corrupting public officials by money or valuable presents, influence can be brought to bear as in private contracts and, without fraud, a contract can be awarded to a firm making a reasonable bid, yet not the lowest. The contractor can show the officials that the low bid is a money-losing one and may cause trouble, that his record for carrying on work of the kind in question is a better one than his competitors, and that he has better plant and resources to do the job. Such facts may be of no avail, yet if presented through friends or by open letters, they may be the means of obtaining contracts. Such things have happened on important contracts awarded in New York City and elsewhere.

CHAPTER II.

MAKING CONTRACTS AND OBTAINING BONDS.

IT IS an essential principle of contract law that before two parties can enter into a contract or an agreement they must come to terms, that is, they must have a common understanding of the terms of their agreement. In other words, the minds of both parties to the contract must meet and agree. This must be the case in regard to contracts for construction.

Conditions Preliminary to Signing.

It is also well understood that an offer plus an acceptance makes a contract, the obligations of which cannot be escaped. Before such an offer can be made, however, information must be furnished the prospective bidders, so that they can make an intelligent proposal.

When the owner furnishes certain information to a contractor and the latter makes a proposal, an agreement is concluded as soon as the proposal is accepted, although the formal contract may not be signed. Thus there are certain responsibilities resting on each party preliminary to signing a contract.

The owner furnishes the plans, specifications and other data upon which the proposal is made. A clause is generally inserted in the specifications stating that the owner does not accept the responsibility of the accuracy of the information furnished, as the contractor must verify all such information himself and accept the responsibility. Such a declaration, however, does not relieve the owner of his responsibility. Reasonable changes can be made in plans and quantities, but the entire basis of the contract cannot be changed. For instance, if the original contract called for the construction of a sewer, plans could not be changed so as to build a reservoir instead. The owner is responsible for his own plans, unless the contractor agrees to furnish the plans and relieve the owner of this responsibility. Likewise the owner is responsible for all data furnished that cannot be verified within a reasonable time or at a reasonable cost by the contractor.

The owner cannot be compelled to award a contract because a proposal has been submitted, nor accept any particular proposal. Nor is he responsible for any erroneous conclusions or deductions made by the contractor from the plans and specifications or regarding the work. The owner can delay accepting a proposal and later hold the contractor to his proposal unless a time limit has been set upon the acceptance.

The contractor's responsibilities are greater, before the contract is signed, than are the owner's. He must verify, as far as possible, all data furnished him by the owner upon which to base his proposal. In case of disputes as to this verification, the courts alone can decide to what extent the contractor must go. However, the contractor cannot be deceived in such matters by the owner. The contractor is responsible for his proposal and the figures submitted. Any errors made in prices are at his expense, and he can be made to do the work at the prices submitted or else stand the legal consequences. The contractor accepts the responsibility of visiting the work and thus assumes all the responsibility of the local conditions surrounding the job.

He is a free agent as far as making a proposal is concerned, and a declaration that he intends to make a proposal does not bind him to submit one. Once he has made a proposal, he must accept the responsibility of it. This has been set forth in Volume I, pages 36 to 38.

A contractor cannot shirk his responsibility previous to signing a contract by declaring certain acts were those of subordinates, for he is responsible for them. Nor is lack of knowledge for any act a legal excuse.

Private Contracts.

Conditions surrounding private contracts before they are signed are not as binding as with public contracts. It is seldom necessary, on private contracts, to deposit a certified check or make a bidding bond. Thus if a contractor does not wish to accept an award of a contract on his proposal he does not forfeit a bond or his certified check, and the owner's only recourse is to sue the contractor for the difference between the cost of the work and the prices submitted by the contractor, if the cost is in excess of the proposal.

Should the work be awarded the contractor, he need not sign

the contract submitted to him, but can endeavor to have certain changes made in the form of contract or the specifications and even in the plans. A man of marked ability and of great shrewdness can often accomplish such things to his own great benefit. Likewise time limits can be changed and forfeits cut out of contracts. If, however, an agreement cannot be reached as to such preliminary details, the contractor can refuse to sign the contract and the owner's only recourse is to enter suit as previously explained.

It is also possible on private contracts for the contractor to begin work before signing the contract. Thus work can go on for some days before an actual contract is entered into, giving the contractor certain advantages in obtaining concessions or in extending the time limit, for the time of a contract dates from the signing of it.

Public Contracts.

Few of these things can be done on public work. The stipulation regarding signing the contract, is, generally, that it must be signed within ten days of the award, otherwise the certified check or bidding bond can be declared forfeited. Changes cannot be made in the form of contract or the specifications, for after these are once drawn up and approved by the proper officials and bids have been received, no one has authority to change them, unless all the bids are rejected and new ones asked for, when changes can be made before proposals are received a second time. The depositing of a certified check or bond prevents the contractor from refusing to accept an award, unless he prefers to forfeit his bidding bond or check. Even then it is possible to sue him for the extra cost.

Thus, with a proposal once made on a public contract, the contractor must accept the award or stand the consequences. This shows the importance of going into all details regarding the work, the contract and the specifications before bidding, as the proposal made becomes part of the contract as soon as it is submitted.

On the other hand, the public corporation can hold up the contractor for days, weeks or months, and then reject all bids, if the officials deem it expedient. The only binding action of public officials, before signing the contract, is in announcing the award, which must hold if the contractor is willing to sign. If he is refused this right after the job is awarded to him, he can sue for prospective profits and recover.

Signing Contracts.

The signing of all contracts, to be legal, must be in the presence of witnesses. The number necessary varies somewhat in different states, two witnesses being the general practice. Both parties to the contract need not be present when a contract is signed, unless the document states that the contract was signed in the presence of each other and in the presence of the witnesses. If this is not stated, one party can sign the papers in the presence of witnesses and the other party sign it later in the presence of his witnesses, the date of each signature being given. As a rule, it is better for both parties to the contract to sign at the same time; then there can be no question as to the signatures or the witnesses. The date can then be filled in at the same time.

In case of a firm of contractors, it is sometimes necessary for each member of the firm to affix his signature. This has the effect of holding not only the firm, but also each individual to the obligation of the contract. With a corporation of contractors this is not necessary, as the executive officer signs the contract, with the name of the corporation, and his own name with his title. The secretary of the corporation should then attest to the document and affix the seal of the corporation.

Though not absolutely necessary, it is generally advisable, when signing a contract, to have several witnesses present, as these may be of value later if trouble should occur. In some cases, however, this may give the appearance of distrusting the other party to the contract. It is seldom advisable to have an attorney present when a contract is signed, unless the other party requests or suggests it.

In making contracts with private parties it is not always necessary to have the bond, stipulated in the contract, ready at the time the contract is to be signed, as frequently the bond is made afterwards. In nearly every case for a public contract the bond must be ready at the time the contract is signed, and in some cities and states some official of the bonding company must also sign the contract or a bond certificate that goes with it. Thus during the ten days between the award and the time of signing, the bond must be obtained and approved by the public officials.

As a rule, ten days is ample time for this—it is often done in one—but when difficult bonds must be obtained and bonding companies are not satisfied with the contract or the prices sub-

mitted, all of this may be needed. It is not well to defer such a matter, even for a day. When individual bondsmen are accepted and used, an attorney for the owner generally draws up the form of bond for the bondsmen to sign.

Oral or verbal agreements become void as soon as a written contract is signed. No matter what may have led up to the making of a contract, the written document stands alone. Nor can conversations or promises that may have been made to induce any one to sign a contract be used as a means of escaping the penalties of the written document or of showing fraud. The contract alone stands, and in case of trouble the courts interpret the contract.

Public contracts, to be legal, must be signed by the proper officials, set forth in the law or in the special acts that provide for the construction work. The contractor cannot recover for the work done if the proper officials do not sign the contract, and the law throws this responsibility on him. He must look up such laws and know for a certainty that his contract is drawn and signed according to the law. The public official does not suffer nor can he be held personally liable to the contractor. Other phases of public contracts that should be considered before signing a contract are commented upon in Volume I, pages 12-14. Likewise the financial standing of private parties to the contract, and the need of investigating their responsibility, which should be done before signing a contract, is given in Volume I, page 49.

Some few laws concerning public contracts allow contracts to be made only with residents of the state, or with corporations that are either chartered in the state or have registered, in order to become a local corporation. Under such circumstances it is not necessary in signing a contract to add the place of residence of the contractor or contracting corporation, but when the law permits a contract to be made with a resident of another state, or a foreign corporation, then the residence or home office should be inserted after the signatures, so that suits, if necessary, can be carried on in the national courts, instead of in the city or state courts, as explained in Volume I, page 35.

Modification of Contracts After Signing.

Contracts after once being signed cannot be changed or modified except by mutual agreement of the two parties to the contract.

If actual changes are made in the text, the validity of the contract may be questioned. If it is found necessary to modify the contract in any way, it should be done by supplemental agreements or contracts. If some clause or paragraph only is to be stricken out, then a statement attached to the contract to that effect and properly signed and witnessed answers the purpose.

A contract can be changed or modified in this manner by a supplemental agreement at any time or as often as desired if both parties agree to it, but if one refuses, then the contract cannot be changed or modified.

At times contractors and owners agree to modify contracts, yet nothing in writing is given by either party, with the result that in case of a dispute the verbal agreement, even if it be witnessed, is not likely to hold, as the written contract will stand. On the other hand if letters are exchanged between the two parties, and these letters are preserved, the changes are likely to stand. Letters, however, can be lost and even repudiated by the writer, so that the only safe way to change or modify a contract is by supplemental agreements, properly executed.

Changes in Specifications.

Although specifications are always made part of the contract, and must sometimes be signed by both parties to the contract, there does not seem to be the same feeling in the courts against changes in the text of the specifications. On public contracts, engineers and other public officials are without authority to change specifications, but sometimes ignore them to the contractor's advantage.

On private contracts it is possible to make changes in the specifications, and this is frequently done without anything in writing to show for it. This is a loose way of doing business, but contractors are sometimes compelled to submit to such things. When changes in the specifications are made by the engineer, the contractor should ask for a letter setting forth the change, and upon receiving it, acknowledge the receipt. This makes the change binding.

Every contract and set of specifications provides for changes being made in the plans and work at the discretion of the owner or his engineer. Such changes are made in most cases without consulting the contractor. Some may be of benefit to him and others may be a decided injury. In most cases he must submit

to these changes, filing protests by letters against those that injure him. The harm that can be done by such changes has been set forth in the Addenda of Volume I.

Contracts With Sub-Contractors.

Nearly every contractor has contracts to make with sub-contractors, if not for work to be done, at least for materials. Contracts for materials can be made, and in many cases are made, entirely by letters; that is, a quotation is given and accepted. This is not binding, however, as the price given can be withdrawn by letter, or a time limit can originally be set upon the price. All such quotations are given subject to strikes, floods and other risks beyond the control of the seller. Thus it is better to have a written agreement as to prices, fixing them for a year or some given time, or better still, during the life of the contractor's job. As the quantities needed by the contractor are more or less uncertain, it is well to name in the contract the quantity probably needed and then use the expression, "more or less." Such a contract should be signed and properly witnessed.

Sometimes it is necessary to stipulate in the contract the time of deliveries, so that the contractor can control them. This may mean much in several ways. The contractor does not want to be held up waiting for deliveries and he does not want to have material shipped to him so that he must store it and and rehandle it several times before using it. The author knows of a case in which a contractor made a contract for a large amount of structural steel, but failed to state when deliveries were to be made. The steel company shipped it weeks and months ahead of time, using up much of the contractor's profit on the steel by rehandling and storage charges. The contractor could have saved this money if he had used a little forethought.

A contract must be made with sub-contractors to whom work is let. Some general contractors use for their sub-contractors the same form of contract that they sign with the owner. Many sub-contractors are responsible and well able to fulfill their agreements, but there are some that have little financial standing; thus it becomes necessary to have a form of contract that will hold a man that may not hesitate to jump his contract.

The contractor must therefore use a form of contract that will bind the irresponsible men as well as the responsible ones. Though

the latter may sometimes refuse to sign such a drastic form, this will seldom happen, since such men will readily see that the rigid provisions are not placed there to injure a man who wants to do the right thing, but to hold the irresponsible man. It is always possible to write up a special form of contract for anyone who objects to the usual one.

Every sub-contract form should have space in it to insert the principal items of plant that are to be used on the job. This is necessary, for the progress to be made on the work is dependent on the outfit used. Then if the sub-contractor does not own such plant or cannot procure it, the general contractor is in a position to take immediate action to protect himself.

The time limit given a sub-contractor should always be less than that of the general contractor; otherwise if a sub-contractor fails, the general contractor may not have time to relet the work or to finish it with his own forces.

The form of contract should make the general contractor the sole judge of whether the sub-contractor is making the necessary progress and should give the general contractor the right to take over the work in order to finish it on time. The form of contract need not be long, but should be specific and fair to both sides.

Breaches of Contracts.

When breaches of a contract occur, a contractor should be guided entirely by his attorney, for one legal misstep may mean that he cannot recover for work done or his prospective profits. A breach may be caused by either party to the contract. Those caused by the owner can result from :

- Changes in plans and specifications.
- Changes in location of the work.
- Failure to make payments.
- Arbitrary rulings against the contractor.
- Failure to furnish plans and other information.
- Failure to obtain legal permit.
- Ejecting a contractor from the work.

Breaches of contracts can be due to the contractor from the following causes:

- Not following plans and specifications.
- Not furnishing plant and men.
- Delays on account of materials.
- Neglecting the work.

Skimping work.

Not conforming to laws.

Besides these, there may arise such intense personal feeling against one party of the contract that the other party will take any excuse to declare a breach of the contract. The party causing the breach can be held responsible by the other party and can recover by instituting suit.

Most of these breaches have been discussed in Volume I, pages 17-19.

Declaring Contracts Forfeited.

When breaches occur for any reason, the party not at fault can declare the contract forfeited. This is done by giving written notice in accordance with terms set forth in the contract. If the owner is the one to declare the forfeit, then the contractor should protest by letter, not only against the forfeiture, but also that there has not been a breach caused by him, and should continue work, if possible with his entire force, and at least with part of it, until he is ejected by law officers or actually stopped by force by the owner. This will strengthen his case in the law suit that is bound to follow. Every move that he makes should be at the advice of his attorney. The same general procedure can be followed either with a public or private contract.

In both cases, the notice of forfeiture and order to stop work must come from the proper person, designated either in the contract or by law to annul the contract. Should the wrong person order the work stopped and then have the contractor ejected, the latter's chances for recovery are much greater than if the proper officials acted. Authority to declare a breach or a forfeiture and to annul a contract cannot be delegated to another. The same care must be exercised by a general contractor in declaring a contract forfeited with a sub-contractor. One of the most sacred things in the law is a written contract, and if a contract is to be terminated it must be done in a legal manner.

Recording Contracts.

Heretofore it has not been customary to record construction contracts in the public records, and in few cases is this necessary. Nevertheless, contractors should learn from their attorney if state laws compel the recording of contracts to maintain certain rights.

If they do, all contracts and supplemental agreements should be recorded with the proper officials. By paying a fee it is always possible to obtain certified copies of public records, including contracts that have been recorded.

Conforming to the Law.

In Volume I the need of knowing the law and enabling acts in regard to construction work has been called to the attention of the reader, and under breaches of contracts mention has been made of conforming to the law. Today there are a number of laws regarding workmen, compensation for injuries, paying workmen at certain intervals and similar things that make it vital to a contractor, not only to know the law, but to conform to it. To break some of these laws may subject the contractor to a criminal prosecution, or even to a loss of contract. In the state of New York the court of appeals has decided that a contractor who breaks the 8-hour law by working men on public work more than 8 hours a day causes a breach of the contract and cannot recover money earned or prospective profits on the job. Ignorance of the law is never an excuse. Therefore on public work a contractor must know the law and conform to it.

Obtaining Bonds.

Most construction contracts call for bonds for their faithful completion and for other stipulations of the contract, such as maintenance and suits for damages for infringing upon patents.

To the young contractor, a bond for the faithful completion of a job is an impressive matter and one that gives him much concern; to the more experienced man it is a mere incident, one that under ordinary conditions is given but passing attention. In some ways bonds mean little, while at times they can be quite troublesome.

Personal Bondsmen.

Some years ago personal bonds were the only kind that could be obtained and personal bondsmen are still used even on construction. Inasmuch as such bondsmen seldom charge for assuming their responsibility, this form of bonding is considered inexpensive. It might, however, prove very expensive and in many ways it is

unsatisfactory. Naturally the man asking the bond is under obligations to the bondsman, and this obligation has compelled many a man to endorse a bondsman's note to his sorrow. Then the value of property changes and fortunes are made and lost rapidly, so that a bondsman of one day may have lost his property before the bond expires.

With personal bondsmen, in case of the bond being forfeited, recovery is made easily in most cases, as the ordinary man unaccustomed to legal affairs feels that he is responsible and pays, if he has the money or property, without questioning, when demand is made upon him. This in itself is wrong, as there are always two sides to any controversy, and frequently bonds are not forfeited when claimed.

Personal bondsmen should co-operate with the contractor to see that both maintain their rights. There may be no suspicion of dishonesty, but at the same time it is better that they have an understanding so that neither may be imposed upon.

Personal bondsmen on contracts for the national government can expect little mercy. If the contractor fails or throws up his work, they will have to finish the job themselves or allow the government to do so, the bondsmen footing the bills. Their money, if needs be, will be taken to the last cent. This has occurred again and again with inexperienced contractors and personal bondsmen. For these reasons it is seldom that personal bondsmen are used in these days of bonding companies.

An exception to this occurred in recent years in New York City. A firm of contractors was the low bidder on a large and important contract. A bonding company to which the firm applied for a bond refused it, saying the prices bid were too low and this meant that other bonding companies would do the same thing, for in nine cases out of ten bonding companies are like a flock of sheep. If one refuses to write a bond the rest are more than likely to follow suit. There are exceptions to this custom which is due partly to the conservative method of doing business and partly to the fact that few engineers for bonding companies have had any experience in contracting and are unable to advise their companies knowingly in some cases.

This firm was refused a bond and the ten days following the award had nearly elapsed when they turned to a personal bondsman. This gentleman was a very wealthy contractor, experienced in city

work, and he himself pledged his property in bond. Later he took over the work, allowing the original firm to select the part they wanted to retain. He sub-let some other parts, did some himself, carried the bond, and the entire job was finished at a handsome profit.

Unless a most careful analysis of costs, methods and prices is made, it is very difficult to state that prices are low or high.

Bonding Companies.

Today most bonds are written by bonding companies and the basis is naturally changed from the old one of personal bonding. The bonding company exacts a fee or premium for writing the bond, guaranteeing that the contractor will make good and live up to the terms of the contract and bond agreement. The fee or premium varies somewhat, according to the character of the bond and the amount of the contract. Under the contract and bonding agreement, the bonding company becomes a principal in the contract, yet few contractors, especially those with limited capital, realize this and take advantage of it. The contractor becomes stronger and better able to protect himself against injustices.

Many engineers and owners seem to think that a bond is a great protection to them. The value of the bond varies with the character of the contract. The United States Government can and does enforce bonds nearly to the letter of the law. State governments and the larger cities to some extent do likewise, but private corporations and individuals are sometimes worse off with a bond than without. For a rascal or defaulting contractor, a bond is a protection to the owner, for few bonding companies will refuse to live up to their agreement when it is clear that it has been broken. Such cases are, however, exceptional. Today most bonds are declared forfeited over controversial matters, so that the bonding companies will stand a law suit before paying the bond. Thus a contractor, who might be dealt with easily by himself without a bond, cannot be made to do as the engineer or owner wishes, when the bonding company must be consulted. The bonding company and contractor stand together against the owner and his engineer. Damages, according to law, must be proven before they can be collected, and a million dollar bond does not mean that the amount named can be collected. A house worth only a thousand dollars

may be insured for five thousand, but in case of fire only the actual value can be collected. So it is with bonds.

There are millions of dollars worth of bonds written every year, over which no troubles arise, and for this reason many experienced contractors pay little attention to their bonds, looking upon them as a mere necessary item of expense. Inasmuch as serious trouble can occur, it is well to consider bonds at all times, so as to be in the right position, should difficulties arise.

Kinds of Bonds.

There are a number of different kinds of bonds used by contractors: proposal bonds, bonds for the faithful completion of the work, bonds covering this feature and a guarantee of construction and maintenance, and bonds for the completion of the job covering damages for suits that may arise over patented devices used in the work. Separate bonds can also be obtained for guarantees and for patented articles used. There are also bonds for the faithful completion of a contract covering a bonus and forfeit for the non-completion by a given date. All of these bonds are used by contractors, but the one in most common use is that for the faithful completion of the work only.

Some features of proposal bonds are discussed in Volume I, pages 40 to 44. Certified checks and the substitution of proposal bonds for them and for cash deposits are also dealt with.

Guarantee Bonds.

Guarantees and maintenance bonds are much used on new kinds of structures or those built with new materials, and also on street and road work for cities and towns. In most cases these bonds are an economic fallacy.

There are many kinds of guarantees and each is more or less dependent upon the character of the structure. Contractors to some extent are responsible for some guarantees being demanded. For instance, in introducing reinforced concrete as a building material a decade ago, contractors realized its advantage much earlier and quicker than did many engineers. Thus contractors preached concrete and its use to engineers, many of whom gave only a deaf ear. In order to obtain its use over other materials, contractors were willing to guarantee its strength and their work-

manship. Likewise, with many kinds of paving materials, contractors, in order to obtain their use, have been compelled to guarantee them. These guarantees, once made, have been demanded ever since.

It is evident that a guarantee means one of two things. Either the contractor means nothing by his guarantee, that is, he does not believe it will entail any loss or additional expense, and thus counts on it as a mere promise that will not need to be fulfilled, or else he realizes that under his guarantee there is an obligation that he must make good, an obligation that may mean an extra cost, not only at the start but for some years to come.

The first kind of a guarantee anyone can give, whether he be responsible or not, while the second one will be given by a responsible man only after mature consideration. If he is to remain one of responsibility, he must add something to the price he bids to cover the possible extra cost due to his guarantee.

At times a guarantee can mean little save loud protestations that a structure is correct both as to design and workmanship. The ability to swear and affirm does not add to the strength or affect the workmanship, yet such guarantees are accepted. Likewise, guarantees as to time limits are often accepted without question, only to bring trouble in the end. A few years ago the author had to bid upon a job amounting to about three-quarters of a million dollars. It was stated that the time limit guaranteed by the contractors bidding would be given consideration with the prices bid. The author's bid was within 1 per cent of the lowest bidder. He also stated he would finish the work in 10 months, stating what plant would be used to accomplish it. The lowest bidder guaranteed an 8-month finish, listing a much smaller outfit. In spite of the closeness of the bids, the work was awarded to the lowest bidder. When attention was called to the fact that it was impossible to complete the work within 8 months with the plant specified, the engineer's reply was, "We have the contractor's guarantee in writing for an 8-month finish." Such a guarantee, when backed only by protestations, as it was in this case, amounts to nothing. The low bidder took nearly 20 months to complete the work and the company could find redress only in a law suit, which brought forth counter-claims for delays and damages.

The best guarantees are always questionable. Even a bond is a poor guarantee. To obtain damages under it requires in most

cases a law suit. If the contractor is willing to live up to a guarantee, it can be set down as a fact that he has included something in his prices to cover some extra cost; if he has not, he will be unwilling to make good the guarantee and unless it is a matter of minor importance, the bonding company behind him will likewise refuse to make good. These are not matters of surmise but of experience, based on many jobs in different sections of the country. What is so of guarantees is to a great extent true of maintenance clauses in contracts. There is an extra cost added to the bidding prices, the only difference being that the maintenance can be figured much more accurately than can a general guarantee.

In ordinary business it is generally set down that one cannot obtain something for nothing. This is so in contracting, both as to guarantees and maintenance clauses. Both must be paid for; if it is not done out in the open, it is hid under various prices paid for the work. The solution to this is not hard to find and the remedy is one of common sense business.

The engineer and owner should look into and have tested all building materials. They should, through the contractor, select and purchase such materials. When materials are brought to the job they should be carefully inspected and, if necessary, tested. The specification should be explicit as to these materials, so that any intelligent man can follow it, knowing what to accept and what to reject. Care and caution must be exercised in drawing up specifications for materials so that they are not made so strict that they bar all local materials and make any material man afraid to submit his goods. The various engineering societies are gradually agreeing as to specifications governing the inspection and testing of building materials. Their standards can be followed in nearly every case.

Plans for work should be drawn up with care and be complete from the start. The specifications should be explicit and be specific, written for the job in hand and not copied from some other set of specifications verbatim, as is still done too frequently. With these things and the proper inspection there should be no need of either guarantees or maintenance clauses.

Proper inspection is not secured by placing on the job an inspector at a small salary, as is done on most public work. Such a man, without past experience, without any training as an engineer, possibly with poor judgment, more than likely to be a grafter

or one who can be made a grafter by the first temptation, should never be selected as an inspector. Instead, the inspector should be an engineer, competent to supervise a part or all of the work, whose duties will permit him to spend most of his time on a certain part of the job and see to it that only good materials are used, that the plans and specifications are followed, and that good workmanship is used in carrying the job to completion. The cost of the engineering attendance on the work may be slightly increased, but the job will be a more satisfactory one, and the entire cost will be less than when guarantees are demanded.

The city engineers of many of our largest cities, realizing the trouble that occurs with guarantee bonds for street and road work and for maintenance, are now advocating doing away with such bonds and, instead, holding a cash deposit from the contractor, to bind him during the period of guarantee and maintenance. This in many ways is worse than the bond. The city will be better off in obtaining repairs, for it can make them if the contractor refuses and pay for them out of the deposit. A contractor, however, who does a number of jobs each season, will quickly have a large share of his capital tied up. He must protect himself by charging such prices as will keep him going. Thus the contractor is handicapped and the city pays more for its work than it is worth. The results cannot be economic ones. This fallacy should be quickly eliminated from contracting.

Bonding Brokers.

Bonding companies maintain an engineering bureau to decide upon the writing of ordinary bonds, and through this bureau they also keep posted as to the progress made by contractors and difficulties that may arise.

There are a large number of bonding companies and each one is looking for all the business that can be obtained, but in order to make money and not impair the value of their bonds they must be cautious and exercise discretion in their risks, so that new contractors do not always find it an easy task to obtain the bonds they need. To a great extent the trouble lies with the contractors themselves and with the manner in which they handle this end of their business.

The first impulse of anyone is to deal directly with the company or the general agent of the bonding company. The impres-

sion is that better service is obtained, and that the middleman is at once cut out, so that the bond may be obtained cheaper than by other methods.

The author's experience has shown very conclusively that this is wrong. The best method is to do all bonding business with a broker and not with one company. The broker in most cases will not be bound up with any one company, but will do business for any company. If he is a bright, hustling man he will always have plenty of business, hence the bonding companies will cater to him more or less and he will be able to obtain many favors for himself and his clients.

The proper procedure is to do all business with a broker. Select a good man and have him attend to everything in connection with bonds. He will be able to furnish bonds for work in different states and any kind of a bond needed.

Confide to him in a general way your financial standing and other matters pertaining to your business, but do not be too definite as to details. At times he may not wish to know too much about your affairs. Do not know or meet any officers of the bonding companies, or their general or special agents, except those the broker cares to have you meet. Let all information regarding you be furnished to the companies by your broker.

Have him fill out applications and other papers that may be necessary. Know what you are signing, but don't know too much about other things that the broker may be doing. He will furnish you with proposal or biddings bonds on short notice, also with any other bonds that may be needed. He may switch you from one company to another, but these things are his affairs and a contractor should not interfere, as long as his interests are amply protected.

If any trouble occurs with the engineer or owner that must be carried to the bonding company, address your letter to your broker and have him handle the matter with the company.

The broker will be able to obtain bonds and other favors that could not be secured in any other way and knowing rates and charges, he will handle the matter in the most intelligent manner, and will frequently save money for his client. In handling a large amount of business from one man, the broker, although he is not supposed to, may obtain some valuable concessions, which will mean a saving of money. The relations at all times between the

contractor and the broker should be confidential. You can recommend your broker to other contractors, but avoid telling others how you do business with him.

Applying for Bonds.

The character of the bond to be obtained by the contractor governs the information that the broker and bonding companies will want from the contractor and the kind of a showing that he must make in order to obtain favorable consideration.

For a proposal bond the main thing necessary is a financial statement showing the assets and liabilities of the contractor, with some data as to contracts awarded and finished, to show that he is a man who carries out his agreements. The beginner naturally has nothing to show as a record of work done, so it is necessary for him to give some good personal references vouching for his ability and integrity.

For construction bonds, the data that must be furnished is the proposal made, a copy of the contract and specifications, and, in some cases, the plans of the work. This is more especially the case with public contracts. On private work the demands of the bonding company are seldom so numerous. The financial standing of the applicant, together with his record of work done, is sufficient. In most cases an application form is furnished the contractor and if he is wise he will have his bonding broker fill out the form, furnishing the necessary information to him. Thus, after a number of bonds have once been obtained, the broker will attend to such matters himself, seldom bothering the contractor.

For bonds with guarantees, forfeits and other objectionable features, the bonding company becomes more particular, and this is but right. The premiums for such bonds are generally higher and the bonding company must feel that the man purchasing such a bond is perfectly reliable.

For special bonds, such as those meant to cover damage and to guarantee payments, special information may be demanded by the bonding companies, and even then all companies will not care to furnish such bonds.

Other Kinds of Bonds.

The salient features of the ordinary bonds used by contractors have been discussed, among them proposal bonds, construction

bonds, including guarantees and maintenance as well as those covering a bonus and forfeit. There are, however, a number of other kinds of bonds that a contractor may have to furnish. Mention has been made of bonds covering inventions, damages and payments.

A bond covering inventions is meant to hold free from injunctions, suits for damages and royalties, all patented articles and devices as well as methods used by the contractor. These things may or may not be specified by the owner, but he will demand a bond if they are used, throwing upon the contractor the cost of all legal proceedings, damages and royalties awarded to the patentee in case a suit is brought. The holder of the patent may sue the owner, but the bond compels the contractor and the bonding company to defend the suit, or at least to become a party to it.

For this reason it is questionable if a contractor should lay himself open to such a suit by using patented designs, plans, machines, and methods or processes, unless he owns the patent rights. An engineer may design a concrete bridge which infringes certain patents. If a contractor building the bridge on these infringed designs furnishes a bond against suits for infringements to the owner, he has made a contract that makes himself and the bonding company liable for the acts of another. It would seem on the face of it to be poor policy to do such a thing, yet it is a fact that many contractors in the past have done this and more contractors than ever before are doing it today.

At times, contractors must assume responsibility for damage to surrounding property that may be caused by the structure they are building, or by employes or machines. Though, in many cases, such damages amount to but little, there is a possibility that the damage may be considerable. Thus many bonding companies refuse to write such bonds unless the standing of the contractor is unquestionable. A contractor may have considerable trouble in having such a bond written, so he should never attempt to obtain it personally, but should turn the matter over to his broker, who will procure it, if possible.

In handling and using explosives it is sometimes necessary to furnish such bonds. If a bond for damages of this kind can be procured, it becomes necessary for the contractor to see that all explosives are handled and used strictly according to law; other-

wise he will have to pay for all damage that can be blamed by others on explosives.

It is often convenient for contractors to pay freight bills weekly or monthly instead of as each shipment is received. This is also the case with other accounts that demand cash payments. It is sometimes possible to secure credit on such accounts by giving a reasonable bond when it is impossible to arrange for it in any other manner. These bonds can generally be obtained by showing the financial resources of the contractor; if a bond of this character is ever defaulted, however, it will be exceedingly difficult to obtain another.

A bond of this kind is simply insuring that one will pay one's own bills. Insurance can also be taken out, guaranteeing that other parties will pay the contractor. Thus some bonding companies insure bank accounts, giving a bond that the bank will not fail or suspend payment during the life of the bond or policy.

It is also possible to have the owner of the construction or the other party to the contract insured or bonded, so that payments will be made to the contractor according to the terms of the contract. This insurance is sometimes provided by having the owner furnishing a bond to the contractor, but the cases of this kind are few. To suggest to an owner that he furnish a bond would in most cases cause him to give the contract to another bidder.

A contractor can have some one else guarantee the payment, such as having a parent company guarantee the payments of a subsidiary company, or he can take out direct insurance through a policy or bond from some company doing this kind of business.

The desirability of having sub-contractors furnish the general contractor with bond for the faithful completion of their work has been touched upon in Volume I, to which the reader is referred. In most cases the author does not advocate such bonds.

Nearly every business man is familiar with bonding employees who have the handling of money. In the past, contractors have not used such bonds extensively, but it is a practice to be commended.

CHAPTER III.

THE FINANCIAL END OF CONTRACTING.

CAPITAL is necessary for any project, contracting being no exception to this rule. Capital and brains must go together; one is essential to the other. A contractor must not only consider his own capital and financial standing, but also that of the parties with whom he may make contracts for construction.

Financial Standing of Owners.

Much construction work that is done in this country is for existing corporations, either public or private, that are on a sound basis. That is, in case of public corporations, the work is done for towns or cities, or for the various state governments or the national government. Their ability to pay for construction work cannot be questioned. The financial standing of private corporations that are already operating is readily ascertained, so that a contractor runs but little risk that he will not be paid for the work he does.

A large amount of work, however, is done for new corporations, and not only is their financial standing in doubt, but in many cases the chances may be that the new project will never be a paying one.

Such projects are generally the schemes of promoters, and in the past many men engaged in this business have not had very savory reputations. As a class they have been men who are anxious to get rich quick. The names and achievements of many of them who have met with success and made large fortunes have attracted others to the promotion business; the failures have been quickly forgotten. Many contractors have had dealings with promoters, so that it is small wonder that engineers and contractors, who are likewise interested in construction work, should be drawn into the business of promoting engineering projects.

Before entering into a contract or even bidding upon work, the contractors should look up the financial standing of the owner.

Upon public contracts, it is necessary to look up the enabling acts and appropriation bills that call for the improvement or new construction. It may also be important to know the debt-creating power of the corporation. If money is to be raised by bonds, learn when they were sold, or when they are to be sold, and the price they brought or are likely to bring. Look up the time the act allows for the expending of the entire sum, and see if any restrictions are placed on the amount available for each year. Find out the officials who are given special powers over the work and the funds to be spent. In fact, get all the information possible as to the job in question. Few contractors can obtain such information themselves, or after obtaining it, can digest it so as to make it of use. A competent attorney should be employed to do such work and to make a written report upon it.

The financial standing of private corporations or individuals must be investigated. Two sources of information are generally available. One is the financial and credit agencies, such as Bradstreet and Dun. Some financial agencies make a specialty of reporting on companies and individuals in certain lines; for instance, the Lumbermen's Credit Association of Chicago and New York, which reports only on those engaged in the timber and lumber and allied industries.

Inquiries can also be made through the contractor's own bankers. The information obtained from either of these sources may be authentic or it may be largely hearsay. With private corporations, not only must the company be looked up, but also the principal stockholders, directors and officers should be investigated. A report on the company may be favorable, while that on the individuals may show them to be irresponsible. Such men may quickly wreck a solvent corporation. Whether the reports received are favorable or not, make inquiries, if possible, not through strangers who may be friends of the officials of the other companies, but through business associates who may have done business with the other parties, or who may be able to learn of their financial dealings.

At the same time, go to those dealers from whom supplies, materials and machinery are purchased, tell them of the owners, and ask them to investigate them. Other sources of information may be found in special cases. If these various reports fail to agree, it is the part of wisdom to refuse to enter into a contract.

If the reports are favorable and a contract is signed, the con-

tractor should keep himself posted as to the standing of the owner during the life of the contract. If reverses come upon the owner, then the contractor, being cognizant of the facts, can act quickly to protect himself.

Promoting Engineering Projects.

Promoting engineering projects is a perfectly legitimate business and if done along proper lines is honest, and is work that no one need be ashamed of doing. There is no reason why contractors should not engage in such enterprises provided they understand the details of such an undertaking, and realize what it may mean to them. A number of prominent contractors who have been successful promotors could be mentioned.

Besides mining promotions, the most common schemes that call for construction are steam and electric roads, power developments, irrigation and drainage projects, and water supply and sewer systems for towns and cities. Money can be raised without great trouble for many good projects that show prospective profits in operations, but large enterprises that may antagonize companies that already exist, even though there can be little question of their paying when in operation, are very difficult to finance.

This is especially so of railroad projects that compete with existing systems. The financial interests of the country are closely allied and are very jealous of newcomers, making it a very hazardous undertaking to promote and build a railroad that they may oppose. It has been stated that, when the financial interests do object to the building of a new line, they can prevent the necessary money from being secured, or failing in that, can attack the promoters through other interests and so weaken them that the control of the new road will pass from the owners' hands. In other words, the building of the road is either defeated or the road passes from the control of those starting the company. It is true that there have been exceptions to this, but they are rare indeed. Much is heard these days of trusts, and there is no greater trust or combination than the "money trust," although such a trust does not exist through any organization, nor has it any legal status. One cannot even tell of those who form this combine; but that it exists is a fact, and the ordinary promotor will find it useless to attempt to fight these interests. Their influence is great not only in this

country, but it also plays an important part in the money marts of Europe in reference to American projects.

Many small lines or systems can be built without raising any opposition from other interests. When these roads become paying propositions, however, pressure is brought to bear to compel the owners to sell, the sale price frequently being much below the real value. All of these facts should be kept in mind by contractors who contemplate promoting steam and electric roads, especially the former.

One of the first things a promoter must learn, if he wishes to continue in business and achieve success, is not to use his own money, especially if he is a contractor. To do so means to spend his capital without any quick return, so that soon all he has is in the scheme and he has no means of raising additional funds. Almost at the outset others become interested in the venture, and as they enter it to make money, it is but right that they should furnish money to pay the necessary cost of surveys, prospectuses, traveling and similar expenses. Much information must be gathered and formulated, reports must be prepared and in many cases more money must be spent than is anticipated. Many good projects are never put through, owing to the fact that promoters believe only a few thousand dollars are necessary to promote the scheme, when really many thousands are needed.

The enthusiasm of the promoters often causes them to make mistakes or leads them to believe success will be achieved quickly. Those who are asked to invest money will not have this enthusiasm, but will consider the matter from a purely business standpoint, without sentiment. A story illustrates this:

Two southern contractors, who were promoting a road three or four hundred miles long, organized a company, had the necessary surveys made, and had reports and data showing the probable income of the road. They believed it would be an easy matter, with the showing they could make, to secure ample money to build and equip the road, and as a starter they proposed to go to Pittsburgh to secure the rails. Money for their expenses was appropriated and they started off. On the way, one contractor said to the other, "Now, Bill, you let me handle this steel king, as I know how to work such men, and you chip in when I ask you. I will show you how to handle him." Arriving at Pittsburgh, they waited upon the steel king and made an engagement. At the proper time they

laid before him their reports, profiles, maps and plans with estimates of cost; also information covering the character of the country through which the road was to go, together with statistics as to towns, business, probable income and similar details. The steel king listened with seeming interest until they had finished, when he asked, "Gentlemen, what is your proposition to me?" Up spoke the diplomatic contractor and said, "It was our idea that your company, realizing the great value of the bonds we are to issue on this road, would be willing to furnish us with the rails we need in exchange for bonds." "Yes," said the steel man, "we have done that at times and we would be willing to do it for you upon a fair basis. Let me see, I think we could furnish you a ton of rails in exchange for a ton of bonds."

"Come on, Bill, let's go," said the diplomat. When they got outside, Bill said, "Mike, you sure know how to handle these steel kings. Let's go back to South Carolina." This happened more than ten years ago and the road is not yet built.

Large construction projects cannot be built with one man's money, nor with the capital of a few. A few men may start it, but they will find it necessary to secure funds through some banker or syndicate of bankers; otherwise the burden will be too great. A fair amount of stock can often be sold locally, but most of the bonds must be disposed of elsewhere, and in many cases bankers insist on a bonus of stock with the bonds they take over.

Even with small projects, if the promoters are contractors who use their own capital, their working capital is tied up and they are thus prevented from undertaking other work that might prove profitable.

One attractive feature to contractors promoting engineering projects is that not only can they make money on the promotion of the scheme, but also can thus furnish themselves with a job at good prices.

How Promoting Is Done.

Hard and fast rules cannot be laid down for this kind of an undertaking. A shrewd, able man, caring little for business ethics or honesty, may put through a scheme with but little merit by unusual practices, while a man of great integrity, with a meritorious plan, may fail. Then, too, an entirely new project must be handled

in a different manner from the promotion of an extension or an improvement to an established undertaking.

In starting a new project, no tangible assets exist. The promoter must in a measure create these, prove to investors the worth of these assets, and show the money that can be earned. The worth of his scheme and his ability to do this will measure his success.

To illustrate the method of procedure, a new railroad will be considered as the scheme to be promoted. The line selected starts from a fair-sized city, runs through a rich, well populated agricultural section without railroad facilities for 25 or 30 miles, then enters a mountain region, rich in undeveloped mineral deposits, running through this for 50 miles or more, and entering the lower ranges and foothills on the other side of the mountains, where in the various valleys are scattered small farming and dairy communities. The last 20 miles, before connecting with an operating road, is through a heavily timbered country with some small villages. Thus a line about 125 miles long is projected. As the first step taken, the promoter makes himself familiar with the country and the general aspect of the transportation facilities. He finds that the city and the towns beyond it do considerable manufacturing and obtain their coal supply from the road with which his proposed line connects, and that his road will shorten the haul 75 miles or more. The new road will bring into the city much produce and will act as a feeder for the other road. The promoter will have to look up the resources of all the surrounding country and the probable business that would come to it. Then a horse-back ride as a reconnaissance through the country should put him in a position to interest enough men, at least five, to charter and organize the company.

These men should be selected with great care. There should be some local men, in whom the various communities have confidence, men who either have some money or can command money locally, and have influence to obtain public favors and grants. There should be other men selected from New York, or some other money center, men who have good banking connections. It is an easy matter to get respectable men, with good standing but with little ability to assist in floating stock and bonds, to go into a company, and it is not difficult to get dummy directors. Although such men are often selected, the first kind mentioned are likely to prove

more valuable. However, it should be understood with these incorporators that as other interests are brought into the deal, they may have to step out of the directorate to allow these new interests to be represented. To obtain the right kind of men, the promoter must convince them of the merit of the scheme, and show them that it is likely to be a good investment.

To do this before surveys have been made and with the meagre information at hand is more difficult than to do it after this much of the work has been done. This means, however, that the promoter must use his own money for these purposes, while if the company is organized first, money received for the stock can be used to pay these expenses.

In organizing the company it may be necessary, in addition to taking out the charter from the proper state official, to get certain enabling acts from the legislature of the state, or, if the road is to run in two or more states, legislation may be needed in each state. For the purpose of drawing up the incorporation papers and such other special work, an attorney should be employed, for there will be many things for him to decide upon and many legal formalities with which the papers must comply.

The amount of capital stock to be issued must also be decided upon when the company is incorporated, as the capital is named in the incorporation papers. Though the amount can be increased at any time by amending the charter, the amount to start with is an important consideration. The kinds of stock, preferred or common, and how much of each kind, must also be decided. A decision to issue preferred stock tends to make the common stock less desirable. In some cases, the preferred stock is sold and common stock is given with it as a bonus. Naturally, as the interest on the preferred stock is guaranteed, it is more valuable than common stock. In most states that have a railroad or public service commission, the amount of stock and bonded indebtedness of all public carriers must be passed upon by the commission.

As a rule, railroads and many other projects cannot be built from the sale of stock only. Money can be secured from stock sales to make surveys, organize the company, secure rights of way and start the construction, but in order actually to build and equip it, it is necessary to sell bonds secured by deeds of trust or mortgages on the property. If the capitalization were made large enough, bonds would not be necessary, but with such a large capital stock,

the company would be unwieldy and the promoters would not be able to control the company; for as the stock was sold, the majority representation would pass from their hands, as the stockholders elect the directors.

Bonds are generally considered a more favorable investment than stock, as the interest is guaranteed, the rate being fixed before the bonds are sold, and the coupons must be met as they fall due, or else the corporation can be thrown into the hands of receivers. The question of the amounts and issues of bonds should be decided as the company is being organized or soon after. Bonds cannot, however, be sold until the majority of the stock is subscribed or sold and the corporation has some assets. The first consideration, therefore, is to get subscriptions for stock or to effect sales.

The incorporators themselves may purchase some stock and sales in the local territory can be solicited. Sometimes a large block of stock can be sold in this way. If there is much interest in the scheme locally and the people generally are anxious to see the road built, believing that it will be a great benefit, much can be done in raising money. If this interest does not exist, the promoter should attempt to arouse it by public meetings and through the local newspapers. It may be necessary to place a few small blocks of stock with prominent men in order to obtain results locally. Money must be spent for entertainment. Sometimes county governments, towns, cities and even states will pay bonuses to get the road built by a given date, or to get certain parts done. Money can also be raised in this way by the sale of stock, but governments prefer to invest in bonds rather than stock. It is a more difficult matter today to obtain money from counties, cities and states than it once was. Many of these investments have proven poor ones and people have paid taxes for years on account of them. Some states have passed laws preventing public money from being invested in this way.

A number of large cities have assisted new railroads by investing in their bonds. Both Baltimore and Cincinnati spent millions in aiding railroads. The state of Virginia invested money in railroads, and some of the first roads built in Pennsylvania were aided by the state, but before the middle of the last century a law was passed there preventing such investments. This again shows the need of a competent attorney to advise the promoters.

It is sometimes possible to get financial assistance from exist-

ing railroads that the new line will feed. If these roads are strong financially, they do not need this kind of promoting to build new lines or extensions, and either buy outright or lease to prevent competitors from getting control. This defeats the purpose of the promoters, which is to make money on the building of the road. Hence help is not solicited at this stage, as a rule, from such corporations. Instead, an attempt is made to complete the scheme with the idea of selling or leasing after the road is placed in operation. In this event the road is built as cheaply as possible and then sold or leased as though it were built in a first-class manner.

Some money once in hand, it is possible to begin making surveys. These should be made as cheaply as possible, yet exhaustively enough to obtain the best location for the road, with the lightest ruling gradients with the loads, and the cheapest construction. The line once surveyed and located, estimates of cost can be made up. While this is going on, rights of way can be obtained.

If the property owners are interested in having the road built, much land through unimproved property can be obtained as a gift or by payment of a small consideration to make the contract binding. Other land may be purchased very cheaply. If money is not on hand for this purpose, then options running for a year or two may be obtained on much right of way, giving the right to start construction. The land is then paid for when money is received from bonds, and the option is about to expire.

Arrangements must also be made for station buildings, bridges and terminals. These must be located and the cost estimated, and in a town of any considerable size, tentative arrangements may have to be made for yards and other facilities.

The equipment and rolling stock for the road should be considered at this time; but later on they may be arranged for either by purchase or on the car trust plan.

Reports must be drawn up to show the population along the line and at its terminal points, and the business existing or that can be developed. Maps may have to be made showing how this line compares with others and how it will act as a feeder or a distributing line. The mineral resources of the country must be looked up, sites for factories investigated and sources of raw materials for them found. Agricultural products that may be marketed should be made subjects of reports. All of these things should be gone into in an exhaustive manner, so that the promoters can answer any

question put to them. The reports should be made complete for those wishing information.

Next an engineer or reporting company of good standing should be employed to go over the line and make a report not only showing the business to be done, but also covering the probable cost of building and the character of the project as an investment. This report, if favorable, should be printed for circulation.

When this is done, the rest of the stock can be sold and some construction started.

Now the promoter has a company, a line surveyed and construction started, a right of way and some agreements for terminals. He may possibly have some traffic agreements and plans for the establishing of factories and the development of mines and timber lands. These are assets which put the promoter in a position to float his bonds. This is done either by a direct sale, or by an underwriting agreement with bankers or brokers, or a syndicate formed for the purpose. In every case, written contracts or agreements should be made and recorded, and when a syndicate acts, a trustee, who acts for the syndicate and the company, should be named.

The success of the entire project depends not only upon the merit of the scheme, but also upon the manner in which it is handled by the promoter. His earnings must depend upon his success, yet as many fail as succeed. Thousands of promotion schemes are carried to the money centers each year, but few of them get real consideration from bankers and capitalists. Those that have failed in New York City alone have spent enough money in attempting to get financial assistance to pave Broadway with silver dollars. But hope springs eternal in the human breast, and the failure of one man does not deter another from attempting the same sort of scheme.

Promoting Improvements and Extensions.

Another kind of promotion carried on by engineers and contractors is the building of improvements and extensions to existing and operating engineering projects. For instance, a town may wish to improve and extend its waterworks or sewerage system, or an electric road may want to built new lines. They have the executive and possibly the engineering department, but have no suitable connections to obtain the money.

Accordingly, an engineering and contracting company with a financial department and banking associates is called in. Representatives of this company investigate the business that is being done, look up the new business that can be secured and decide whether the project is one to merit their co-operation. Undertaking the work, they may first reorganize the company or consolidate it with another, and put it on a better financial basis. Plans for the new work are then prepared and arrangements are made for securing the necessary money. Through their banking associates, the money is either obtained outright or secured through floating bonds. The contractor secures the work, doing a part himself and letting out the rest. This is a profitable business, and a number of large engineering contracting companies are engaged in it. Few of these concerns have started out in this particular line, but by hard work they have built up a large contracting business, gradually getting in touch with bankers and large capitalists. First they obtained work from them, and later, after showing themselves responsible, they entered into projects that they secured. Honest dealing, responsibility and sound financing are the things that count. The author knows of one contractor, who has had great success in this line of work, who has offered to make good losses to his banking associates when failure came instead of success. This is the kind of a man that succeeds.

Bankers sometimes act independently as promoters, obtaining all the necessary money and letting out the work. They can throw such to any contractor they wish to favor, so it is well to be able to stand in with such men. In other cases, corporations do their own financing, dealing with some banking concern, which sells the necessary bonds to finance the work.

It is well to do all promoting and planning of work in such a manner that the operation of the project will begin and money will be earned as soon as possible. Improvements and extensions can be made later; in case of a stringency in the money market some curtailments can be made, while if all the money needed can be obtained, improvements and extensions can be continued.

Dealing With Promoters.

Contractors, when they do not promote jobs themselves, must deal with promoters, and often, through their own banking and

brokerage connections, they assist the promoters in raising the necessary funds for construction and operation. When contractors become the actual partners of the promoter and know every move that is being made, they can act with confidence that they will receive payment for the work they do; but when the promoters act independently, but with the assistance of the contractors, then, at times, there is grave danger that the contractors will be deceived and will lose money either directly or indirectly.

Under the last named conditions, the contractor should insist on knowing all the details of the promoter's business, especially those concerning contracts which have been made for stock selling and underwriting of bonds. If this information is refused him, he had better withdraw from the whole deal before it is too late and he has lost his own capital. To know that a contract exists for underwriting bonds or raising funds is not enough. He should know the terms of that contract, and should even know whether the parties to the contract have such standing as will allow them to secure the money needed. The author wishes to be emphatic on the subject, as he feels keenly on it, having been caught himself by the fact that in one project in which he was interested, a contract for underwriting had been made. Knowing this he went ahead with his work without knowing the conditions and terms of the contract. If he had seen the "fool contract" he would never have started work, and would have saved himself and others many thousands of dollars. If a copy of the contract cannot be obtained from the promoter, one should be obtained from the public records, as in most cases these agreements must be recorded. In other words, the contractor should know every detail of what he is doing, so that he can safeguard himself in every manner.

A contractor can assist a promoter in several ways. If the contractor has a large capital, he can furnish funds directly himself. He can, through his own banking connections, place the promoter in a way to obtain money, or he can accept bonds either in payment or part payment for the entire work to be done.

Mention has already been made of a contractor's tying up his own capital by furnishing funds direct. The better plan is to put the promoter in the way of securing money for his stock and bonds through bankers and brokers, and thus put all of the construction work on a cash basis. When bankers and brokers take over the securities direct, they are enabled to handle them in large quantities

and to keep them on a much higher plane. Actual cash is secured more easily and quickly, although a large margin on the securities may be demanded. It is better, however, to pay large margins and be sure of the money than to wreck the whole scheme by trying to save a few dollars.

Accepting Bonds for Payments.

A third way for a contractor to assist a promoter is to accept, in payment for work done, bonds of the corporation building the project. In a contract between the corporation and the contractor, a clause should set forth the number and price of bonds to be given the contractor at each payment, when part payment is taken in bonds. Bonds will not pay labor and material bills; so the contractor must either use up his own capital, borrow money on the bonds, or sell them at once. It is seldom good policy for a contractor to hold such bonds, for their value for some years may be in question. The same amount of money invested in gilt edge securities would in all probability net a larger income in a given term of years. To borrow money on such bonds may be only a temporary relief, for if the entire project fails, the securities become worthless and the contractor will have to furnish the banks other securities. Of course, there is a chance the bonds may increase in value, which would be a benefit to the contractor; but, as previously stated, the better plan is to sell them.

When bonds are to be sold, before the contract is made, arrangements should be made with some bank or bond-broker to handle and sell these bonds. If this is not done, the contractor will be compelled to make arrangements monthly for the sale of his bonds, with the result that many delays will occur and the contractor will frequently find himself in straits for money. In such a case, the bonds will be offered at all sorts of prices in order to raise money on them, thus injuring the future sale. These conditions quickly arise and each month grow worse. All kinds of trading have been resorted to, in order to obtain money on construction bonds. This shows the necessity of arranging for a market before beginning work. The ordinary contractor seldom has either the experience or the facilities for disposing of stock and bonds and should seldom attempt it.

These and many others are the considerations that should be

given to such enterprises. Those who have never engaged in them should go into such projects with great caution and only after careful deliberation. Much money can be made in such schemes, and some contracting firms or corporations take only work for which they can furnish funds or can provide the money through banking connections. Others carry on such work, at the same time accepting cash contracts from which money is earned to enter other promotion projects. The prices obtained for such work are always high, as the contractor can dictate his own terms and can insist on a form of contract and specifications favorable to him. There are engineering companies that do nothing but promote construction work, depending upon contractors to associate themselves with them in carrying out the jobs they obtain. Such a connection is a good one for a contractor, but he should never let his enthusiasm warp his judgment in such matters.

Capital Needed for Contracting.

"What is a meal?" has been a legal question hard to define. A doughnut and a cup of tea is a breakfast for one man; another eats fruit, mush, meat, eggs and vegetables for a morning meal. One man is satisfied with a sandwich and a glass of beer for noon-time; another must have a course dinner. Each man declares he has eaten a meal.

It is just as difficult to tell in a general way the capital that any man will need for his business, especially for contracting. One man, with almost nothing in the way of money, relying on his personality to obtain him some credit, but with ample brain and will power, will make a success of a job, meeting all his obligations, and clearing a handsome profit; another with surplus capital makes a failure. The author recalls a man who walked into town without money enough to pay for a day's lodging. Before night he had obtained a sub-contract for a number of masonry culverts on a new railroad. He arranged for credit with merchants to obtain his supplies, also arranged that the company from which he obtained the job should pay his laborers their wages out of his earnings. He went to work and in less than a year was a contractor with a fair sized outfit, doing a job amounting to more than \$100,000.

Many similar examples of hustlers of this kind could be cited. One prominent contractor in the middle west failed twice within

ten years, after starting some years before as a laborer in a construction gang, but after each failure, he, through his natural ability, got started once more, and is now reputed to be a very wealthy man. His education so far as schools and books are concerned is very limited, but he has learned the game of finance by hard knocks and has handled extensive jobs with limited capital, carrying them through when other men would have failed.

This is in contrast to a company that was formed a few years ago in the east, with a fair amount of paid-in capital. A large number of contracts was obtained within a year, and the directors of the company either loaned large sums of money to it or obtained loans by pledging personal security. Everything, however, was done on a large scale and in an extravagant manner, until the company and some of its members became badly involved, when the sheriff sold out all the assets to pay creditors.

Even with all the particulars known for any special case, it is a difficult problem to decide just what capital is needed. It is, however, possible to lay down some general principles, explain some details, and give advice based upon the failures and successes of others.

It is more difficult today to operate in any business on a limited capital than it was some years ago, but at the same time it can be done and is being done by a large number of hustling men, both old and young.

Individuals and Stock Companies.

The cash capital needed for contracting can be considered under two different sets of conditions, depending upon whether it is an individual or partnership doing contract work, or an incorporated company. In the first case, the assets are all the property and money owned by the individual and his associates, whether they put it into the business or not. That is, if two men who are each worth \$50,000 agree that they will put into a partnership agreement \$10,000 each, their combined assets will be considered \$100,000, for the debts of the partnership can be collected under the law from either. Thus, for an individual or a partnership, the amount of money set by for a particular business does not limit the legal responsibility nor the credit in making purchases on open account.

In the second case it is different. Five men may incorporate a company for \$20,000, each taking \$4,000 of the stock. Now each of these men may be worth \$50,000 or more, but legally the assets of the company are but the \$20,000 of paid-in capital. The worth of the individuals has nothing to do with their legal responsibility, as far as the debts of the corporation are concerned. A stockholder can become liable for a debt of the corporation only by doing an illegal act.

Merchants, however, often give corporations credit far beyond their legal worth or financial standing. This is due to several things. First, some merchants are not as careful of their credits as they should be. They are anxious to sell, and seeing an important contract upon which thousands of dollars' worth of supplies and materials are needed, they allow their desire for more business to overcome their judgment as to the responsibility of the purchasers. This is not always true, but has often been the case where a merchant looks after his own credit line or where a corporation does not employ a regular credit man, allowing the salesman to decide upon the amount to sell. Inasmuch as most salesmen are paid more or less on a commission basis, they are hardly the persons to pass upon the financial responsibility of their customers.

Good Credit an Asset.

The matter of credit is an important one, both to the contractor and to the merchant. Prices are affected by credit. That is, a contractor rated as good pay with large assets can purchase goods at a close figure. Even if he does not pay cash for the things he buys, a difference is generally made in prices—unless goods are purchased from catalogues or printed lists that are not subject to discount—over a contractor who has poor credit and a very limited capital. The author recalls a case in question. He was purchasing a large amount of hardware from a jobber who was also selling goods to a subcontractor who had no rating. The jobber asked the author to keep him posted as to when the subcontractor received his payments on the monthly estimates, so he could make prompt collections. Just before the subcontractor was to receive his final estimate, the jobber was advised of the fact. Whereupon the merchant said: "I thank you, but even if the man does not pay me the small balance he now owes, I will be ahead of

the game, for I charged enough profit to justify me in carrying him."

This made the author look up the difference in the prices he and the subcontractor were paying, with the result that an agreement was made to sell the subcontractor goods for his future work at a 10 per cent increase over the jobber's invoice prices made to the author, saving the subcontractor considerable money over his former method of buying.

Another reason why a contractor should be careful of his reputation for paying his bills, is that with limited capital he may have to purchase much machinery on credit; that is, either on open account, with extensions given upon the time of payments, or by lease sale agreement. With poor credit, such purchases can seldom be made, so that a job might have to be done by hand methods, at a high cost, instead of by labor-saving machinery. The man with poor credit is the one to suffer, by the curtailment of his buying power and by the extra prices that he will have to pay.

There are other reasons why some corporations can obtain more credit than is warranted by their capital. One is that the merchant selling the goods may control the corporation or have a stock interest in it, so that he is willing to take the chance of failure, realizing that if the contracting corporation is successful he is making two profits. Another is that there is some one man in the corporation whose personality is so strong and whose ability so well known that merchants are willing to gamble on his success, extending to his company an extensive line of credit, and even at times assisting through their banks in securing loans. These are rather exceptions to the rule, for most merchants and manufacturers treat the giving of credit in a cool, calculating, business-like manner, entirely without sentiment. This position should be counted on rather than any other, although it is also well to remember that the keynote of all credit in business is confidence.

The Individual Handling Finances.

No matter under what kind of an organization contracting may be done, some one man should handle the financial end of the office work. He should have the advice and assistance of his associates, but he alone should plan the finances. He should attend to all banking arrangements, making loans, meet creditors and make terms with them, even if he does not do the purchasing. Bills

should be paid only with his approval. If creditors or others having financial dealings with the organization approach other partners or associates, they should be referred to the financial man. In this way only can any definite policy be carried out, or in case money is not in hand to meet obligations can arrangements be made to satisfy all parties.

Two men may consult together and mutually agree on such matters, but if two men together make calls upon bankers and creditors, the results obtained are seldom the best. In the first place, promises may be made by one that the second may know cannot or will not be carried out. Merchants, bankers and others seldom care to make arrangements for loans and extensions in the presence of several people. It is usual for two men only to arrange such matters, as this tends to confidence on both sides. The author has seen loans asked for fail because several partners went together to see the parties. One man might have secured the loans. Then, too, when two men go together they depend to some extent on one another, so that neither is likely to be at his best, with the result that a flimsy excuse that would not be accepted by one man completely floors the two.

The author remembers a case in his own experience. He had asked the general manager of a railroad company to increase his prices for some work he was doing and to advance him some money to assist in carrying on his work. He had refused to take his partners with him, putting the matter up to the general manager by himself. As was expected, the general manager refused the request, standing out for the contract prices. After a conference of several hours, the general manager stated that even if he might be willing to grant the request, he knew the executive committee of the company would never allow it. This was the opportunity for which the author was looking. He immediately asked to be allowed to put the matter before the executive committee himself. This the general manager could hardly refuse, and arrangements were made to call the executive committee together in special session. The request was made that this meeting be held after the lunch hour. This, too, was acceded to, and the author spent the lunch hour in getting his wits together, planning what he would do and say and jotting down facts and figures to be used at the meeting.

Promptly at the hour he was on hand, and as soon as the gen-

eral manager had acquainted the committee with the facts the author was called into the board room.

Here were six highly successful business men, only three of whom the author knew. For five minutes he talked to these gentlemen on general matters, taking the time to make a mental study of each, so as to see which men to talk to and just what arguments might appeal to each. Then the proposition was put up to them in a concise manner, but with much earnestness, frankly and without reservation. The author then explained, with the best dramatic effect in him, what would be the effect on the company these gentlemen represented if they did not grant the requests. Then he told what he would be willing to do, on his part, for the favors he was asking. Then the author sat down nearest to the man he thought he had influenced the most and began a conversation with him, showing him additional advantages that would accrue to his company if the requests were granted. This started each gentleman talking to his nearest neighbor and the author was asked a number of questions, then was requested by the chairman to leave the room while the committee conferred.

In about a half hour he was again summoned and given "No" for an answer; but not accepting it, he once more began addressing them; first the entire body, then in quiet conversation with first one gentleman and then another, selecting those that had been already partially influenced; and within half an hour the author had the consent of the committee to all of his requests, save for some trifling details.

Not one of these successful business men in the seclusion of his own office would have agreed to this unbusinesslike proposition; but as a body they were willing to do what they would not have done as individuals. As most of these gentlemen afterwards told the author as much, the incident illustrates in a striking manner how several men are at a disadvantage with one.

Maintaining Credit in Contracting.

Next to actual capital, the asset most valuable to any business man is his reputation for good credit. The credit of a contractor is based, to a great extent, upon his capital and the contracts he has secured. This last must not be overlooked, for a contractor without contracts does not possess the credit he does with them;

every merchant knows that purchases made without contracts are a direct drain upon the capital. With jobs in hand, however, there is an income from which bills are paid, and in the end, by profit made on the contract, the capital is increased. A contractor without contracts is like a merchant who is unable to sell goods.

For these reasons every contractor, in setting forth his assets, should show what contracts he has, listing, for instance, a contract for \$100,000 worth of work, 50 per cent completed, with \$5,000 retained percentage; another for \$50,000, 30 per cent completed, with \$1,500 retained percentage, and a third for \$150,000 of work just commenced. Here is \$6,500 of actual cash asset (retained percentages) that comes to the contractor upon the completion of his work, with a total of \$23,500 additional percentage money that will accrue as the jobs progress.

Then for the \$235,000 of work that remains to be done, there is likely to be purchased about \$100,000 of supplies and materials, which means additional earning power, for these things are nominally sold before being purchased.

As previously stated, credit is, to a great extent, based upon confidence. These contracts may not be finished for one of several reasons; yet the owners, the contractor and his creditors all have confidence that they will be, and for this reason the buying and selling and the work go on.

If the owners became bankrupt, the chances are that the contractor could not meet his obligations. Although merchants may realize this, they are willing to sell goods to the contractor. This is credit based upon confidence. If a contractor has a reputation for lying and not paying his debts, then confidence does not exist. One merchant advises another, and even if the contractor has considerable capital and a number of jobs, his credit will be poor, and merchants will sell to him only for cash or at such prices that if they do not collect all their bills they will still earn some profit on the entire amount from the sum they have received. With limited capital, credit is all important. Many of the multimillionaires have made their money because they enjoyed excellent credit.

The following story is told of John D. Rockefeller: As a young man, when he was in the commission business with a man named Clarke in Cleveland, the firm was in urgent need of funds and Rockefeller went out to obtain them. He went alone, which

was wise, and he did not confide his plans to his partner until afterward. For several days his errand was fruitless and his partner did not see him. At last a prominent business man called at the firm's place of business and asked to see Rockefeller. Clarke told the gentleman that he was out, whereupon the business man said: "Tell Mr. Rockefeller that we can use that money he wishes to loan." "Wishes to loan," exclaimed Clarke, "why John is out on the street attempting to borrow money." In spite of this "give away" by his partner, Rockefeller secured his loan from this man, based on the fact that the man had confidence in him. Thus his credit was good for a larger sum than the amount of capital he possessed.

Borrowing Money.

Few men possess enough capital to transact all the business they are capable of doing, hence they must use borrowed money. Loans can be made in only two ways: either by pledging gilt-edged securities—either stocks or bonds that have a ready market value—or quick selling real estate, to an amount greater than the loan; or upon the fact that the borrower enjoys excellent credit and can obtain money upon his own note, without securities or indorsers. All the great financiers of the world have at one time or another been great borrowers. Modern business often demands that loans be made.

A word of warning as to indorsing notes may prove valuable. It is bad practice to ask others to indorse one's own notes. It is placing oneself under obligations to the indorser that may bring trouble and ruin later, for one may feel obliged to reciprocate if called upon. Many, too, have indorsed notes to their sorrow, for in too many cases the indorsers are compelled to meet the notes. A man has no right to indorse another's notes in justice to himself, his family and his creditors, for he may injure his creditors through another man's defaulting.

Rockefeller's ruse of offering to loan money when he wished to borrow it has been used for years and should be understood by all business men. It means first, that the man using it, in a general way, is keeping his business secret. This is an excellent idea, as too many men talk entirely too much of their business affairs. Though it is necessary to give certain confidential information to some of those with whom dealings must be maintained,

the indiscriminate talking of business affairs to nearly every one frequently brings injury to the business. A matter is no longer a secret when told to a second person. General Stonewall Jackson realized this, and not even his staff officers could draw information from him when he had decided upon secret marches and plans of battles. Some of our most astute politicians, such as the late Senator A. P. Gorman, have the ability of drawing secret information from others, while they themselves tell little.

It is a rare occasion when a business man cannot use additional money; not that he may be hard pushed, but because he sees opportunities of making extra money with new capital. If a man approaches another with the offer of a loan, he is given close attention and a kind reception. What is more natural after offering to loan a man money, than to ask him to do the same thing when it is needed? This at once places the borrower in a better position, and he negotiates a loan on reasonable terms when he would have been refused point blank if he had stated his real mission at first. This is really insinuating confidence and establishing credit by it.

Sometimes the same thing is done in stock companies in another way, that is, by selling treasury stock of one corporation to another, or offering to sell such stock. Money is thus raised, and the purchase of the stock is postponed. This exchange of stock is sometime effected without the passage of money, in order to bind together two companies that may be undertaking some job jointly, or that have common interests.

Any business man, when approached to exchange or buy and sell stock, or have a loan offered to him, should act and speak with great caution, for he may find that there may be a counter offer, and he may be committed to make a loan when he does not wish to do so.

Shakespeare wrote: "Neither a borrower nor a lender be." This may be so in the case of a private loan made by one friend to another, when both work on a salary; but the keynote of modern business is loaning money. Our modern system of banking is based upon loans. There is nothing to be ashamed of in borrowing money for legitimate purposes; only when a business is running behind and money is needed for personal living expenses should a man feel ashamed.

Benjamin Franklin, in his autobiography, tells how he made

a practice of securing loans when he did not actually need the money and knew that he could pay it back promptly, doing this so he would be able to borrow money readily when he needed it in his business. This was establishing credit for future needs.

Confidence Versus Credit.

Not only must sound financial credit be established, but it must be maintained. With plenty of money this is not difficult, but when money is scarce it becomes a serious matter. Bills fall due, notes must be met, and there may be little money to cover the urgent obligations. Any man makes a mistake in not communicating with his creditors, or seeing them in person and arranging these matters in a mutually satisfactory manner. A very common excuse for not doing so is one that is not valid, namely, "I know they want their money, not excuses, so I will stay away until I can pay them."

This, in itself, destroys confidence. It is true that people want their money, but most people will act with reason and like to see their debtors and know about what they can depend upon. An old Spanish scholar, in writing about friendship, said, "The path not frequently traveled soon grows up with thorns."

This is especially true of the merchant and his debtor, ending often in suits, attachments, judgments, and sometimes bankruptcy. When a bill cannot be paid, if possible go to see the merchant. Do not at once offer notes in payment. This may not be fair to your other creditors.

It is rather a singular thing about notes, that not all of them are met promptly, nor are they all paid, but the ordinary man who will not be able to meet a bill when due, will make strenuous efforts to meet the same bill if a maturing note has been given for it. Many people know this and ask for notes, for notes become a special promise to pay.

For this reason, to offer notes to one man is unfair to other creditors, who must wait longer for some of their money. A debtor should talk to his creditors honestly and frankly, telling in a general way the condition of his business and just what he wishes and hopes to do. One should be very chary of making promises, for every man should be as good as his word. Do as you say, but do not promise things that you know you cannot do. Promises that are broken only bring on further trouble.

This again shows the necessity that one man alone attend to such things. He can satisfy people better and will not have to make excuses for others or explain that his partners were lying or "jollyng." Nothing is worse than "jollyng" in running financial matters. The jollier is soon found out, quicker than he thinks for, with the result that he himself is the only one he is deceiving.

It is necessary to show creditors that they are no more anxious to have their money than the debtor is to pay them. If the creditor cannot be pleased without notes, then give them for such amounts and time that it may be possible to meet them, but let it be understood that some of these notes may have to be renewed in whole or part.

If capital for operating a business is limited, then the buying should be done from as few firms as possible. This limits those from whom credit is asked, so that only a few instead of a large number of creditors must be dealt with. This makes it better for the debtor and also for the creditors. One prominent hardware merchant of the South, who made a large fortune at his business and who trusted many contractors, once said: "If I know a customer of mine is buying from only a few merchants I can grant him plenty of time, for I can feel assured that he will not be closed out by some competitor, as may be the case if he is purchasing from a large number, when some dissatisfied creditor may throw him into bankruptcy, causing loss to his other creditors."

Although it takes three creditors to put a man into involuntary bankruptcy, creditors are like a flock of sheep; let one get afraid or uneasy and others take fright and follow. A single attachment or judgment levied against a business man soon brings a number of others, and the sheriff or some court officer takes charge.

Overbuying Goods.

Indiscriminate and poor buying injures many business concerns, especially weakening their credit. Ask a number of merchants what has caused them serious loss and trouble and nine out of ten will say overbuying. There is a fascination about buying. Even the small school child loves to spend his penny each day. Only the miser grieves at having to purchase things. It seems so easy to buy, and it is impressive to all concerned. A half dozen shovels are needed, why not make it a dozen? One small pump?

Why, two dollars apiece can be saved by buying two at a time! Thus it goes on until much money needed for other purposes is tied up in the tool house. Yes, these things will all be used, but this money is needed for use every day. One pump at two dollars more would have been cheaper than the two, for this money now tied up in a pump, that is seldom used, would have earned more than two dollars in paying bills before the pump was needed.

Even the merchant who encourages the overbuying distrusts the customer, for he says, "You can sell him anything, so you had better look out to see if he pays promptly." Creditors know that money is being wasted. Buy for immediate needs, so that work will not be held up waiting for supplies and materials, but let the future take care of itself.

Trial balances and statements of accounts can often be used to excellent advantage in buying goods, and in arranging for terms and credit. Confidence begets confidence, and a merchant feels that a man who shows him plainly the condition of his business is one to be trusted. In this connection, there is sometimes the temptation to so change and alter the statement as to make it appear more favorable; but it must be remembered that this defeats the real purpose of showing such a statement, and that it is also a criminal act to obtain goods on a show of a false statement.

Every business man buying goods, as does a contractor, first in one locality and then in another, should make up a statement of his financial standing at least once a year and give a copy of it to the commercial rating associations and agencies. Included with this statement should be a list of the principal creditors, as references for his reputation for meeting his obligations. Such a statement and list can be used to open new accounts with merchants. When it is verified by them, through the commercial agencies and others, the impression on the new merchant is favorable. Every man who is not paying cash for his goods needs such references, and should furnish merchants with names and addresses so that his standing can be looked up quickly. This is a businesslike manner of treating this matter, and much time is thus saved in getting new orders and saving purchasing things either "collect on delivery" or "bill of lading attached."

Contractors should remember that their business is somewhat different from that of the ordinary merchant. The latter is located at the same address for years, and is purchasing to a great extent

from the same firms year after year. His sales may vary somewhat at different seasons of the year, but they will show a certain average for the year, or a gradual increase from year to year.

With many contractors just the reverse is true. They are working in one state this year and another the next, or in two or more localities at one time. They must buy from many concerns, necessarily adding new ones to the list and dropping others. The amount of business done during different seasons of the year varies exceedingly, as it will from year to year. Several large contracts boom the business, while only a few small ones curtail the buying.

For these reasons contractors cannot be treated commercially as are many other business concerns. They are in a class by themselves, and unless merchants have previously done business with contractors they may be somewhat timid and backward in opening accounts with firms whose names do not appear in the rating books of the commercial agencies.

Preferring Creditors.

A bad practice for any one buying on credit is to make preferred creditors. If the fact becomes known, it injures the standing of the man. The giving of notes, except certain kinds of binding notes, wherein judgment for the claim is already confessed, is not considered as preferring a creditor; but to secure a note or a bill by a mortgage on real estate or personal property is preferring a creditor. A contractor can also prefer a creditor by giving an order on his retained percentage, and having this order accepted by the owner. This secures the bill. It is one method of buying when money is scarce and credit poor, but if the fact becomes known, other merchants may refuse to sell to the contractor.

Another method of preferring creditors is by purchasing plant and machinery on lease sale agreement. The lessor does not have a claim on any cash or other assets of the lessee, except for the cost of obtaining possession of the machine, but he owns the article sold until the last note is paid. This takes from the contractor a valuable asset, on which he may have paid more than half the purchase price. The contractor can claim an equity in such machines, but it may cost a considerable sum to enforce his claim. If machines are purchased on open account and only a small payment made on them they are an asset to the contractor, even if later he may give ordinary promissory notes in payment. This is

the best way for the contractor to purchase machinery, if it is possible for him to do so.

All creditors of a man attempt to have themselves preferred in some manner, yet they do not wish a preference shown to others. This fact should be remembered and creditors handled, if possible, without preference.

The Need of Bookkeeping.

A merchant recently made an assignment to a trust company to whom he was heavily indebted, believing that he was down and out and had made a complete failure of his business. The trust company sent an auditor to the merchant's store to go over his books and take account of his stock. The auditor found a dejected business man, from whom he could glean little information, so he decided to find out things for himself.

The stock on hand was found to be a large one and at once the auditor became suspicious, thinking some trickery had been practiced; but upon a thorough investigation he found that the merchant was doing a large business, selling goods at a handsome profit, and that his stock was clean and salable. The only trouble was that he was a poor bookkeeper, not knowing, as he had stated, very much about his accounts—either those he owed or those owing him.

It took several days for the auditor to make out a statement of the business, when he reported to the president of the trust company. At once the two saw the merchant was solvent. He was called into the president's office. The matter was explained to him, when the president said: "Mr. X, from the report of my auditor I find you are a good buyer and salesman but a poor bookkeeper. Your troubles have been brought on solely by a lack of accounting. I propose to lend you enough money to meet your pressing obligations and put a bookkeeper in your shop who for the present will report to me, and I believe within a year you will be in a good financial condition. So get busy and sell your goods."

With a capable young bookkeeper it was only a few months before the merchant was free from debt and on the road to success.

What was true of this merchant has been in too many cases true of contractors. With profit-making contracts, their business has been a failure due to a lack of accounting. The small contractor says: "I cannot afford a bookkeeper. My business is not

large enough." The large contractor states: "I don't need an expensive bookkeeper. My accounts are simple and I have a capable young man who is learning rapidly." Both are losing in money, through this kind of slackness, much more yearly than the salary of a first-class bookkeeper.

No man can keep accounts in his head or in a set of memorandum books. Bookkeeping is more than accounting. Financing can be done successfully only on full data and information, and this must be furnished through bookkeeping. The sooner all contractors realize this, the better off they will be. In considering these questions of finance and capital, therefore, it is supposed that a competent bookkeeper is in charge of a modern set of accounts.

Even if a man is conducting a cash business, he must have a record of his transactions. However, few men do a cash business, especially in contracting.

Hints on Buying.

If purchasing is done on open account, and a contractor's credit is limited, he should not do his buying indiscriminately from a large number of merchants, for then he will have a large number of creditors, and, in case of being short of cash, will find it difficult to keep his creditors satisfied. The large number will be against him. It is not always an easy matter to limit one's buying; for when a contract is being started, merchants and supply men hear of it far and near, and come in person to sell their goods. They sometimes offer very low prices and are extremely anxious to sell. The prices may be lower than can be obtained from the contractor's regular dealers, but the contractor should remember that these same men will be as pressing to obtain their money in 30 or 60 days as they were to sell their wares.

On the other hand, the contractor can obtain these same goods through his dealer, paying more but receiving more time in which to pay, which in the end may be of greater advantage than the lower price. Confining one's purchases to a few dealers will mean that these men, in case of trouble, can co-operate to keep the contractor going. Even without their communicating with one another, the contractor can advise each how the others are treating him. Any merchant is unwilling to extend a liberal credit to a man with limited capital who buys from a large number of firms. A contractor can buy all his meats, groceries, drugs,

feed and similar supplies from a jobbing grocer; all notions, dry goods, clothing, rubber boots and shoes, bedding, etc., from another wholesale jobber; his lumber from another firm, and his coal from still another dealer. All his other supplies of machines, hardware and tools, cement, explosives, oils, pipes, steel and iron can be purchased from his hardware jobber. This would limit his buying to five firms. Not all dealers keep such a variety of goods, but some do and these are the firms to deal with, for in the end the contractor with limited capital will be the gainer.

On the other hand, if a contractor has ample capital, or a fairly large capital and can readily borrow money, he should arrange his buying differently. He is then in a position to let his bills on which discounts are not given run to maturity, while he will be able to take advantage of the discount on any bill on which there is a discount offered, even if it is only $\frac{1}{2}$ per cent. The most common discount offered is 2 per cent for payment within 10 days. Some goods are sold on a different basis, and even larger discounts can be obtained for cash. Sometimes more than 10 per cent discount can be obtained by purchasing goods with "bill of lading attached," that is, paying for them when the goods arrive, either by a sight draft to a bank or to the transportation company. No matter how good a man's credit may be, his money is better, and ready cash quickly earns money.

Discounting Bills.

For this reason a contractor can sometimes earn large sums of money in a year by borrowing in order to discount his bills. The author remembers that some years ago he was in charge of buying a large amount of timber for trestles. The purchases amounted to about \$50,000 worth of timber per month for nearly 6 months. He persuaded the contractor to borrow this amount of money for 6 months, which was done, although a high rate of interest, 8 per cent, had to be paid for it. Thus the contractor had to pay \$2,000 for the use of his money. The note for the loan was for 30 days, but 6 month's interest was paid when the loan was made. This served two purposes: It prevented the lender from calling the loan before the expiration of the 6 months, and it gave the contractor ample time to get his timber framed and placed, so as to earn the money to meet the note at the end of 6 months. A shorter period might have put him in an awkward position.

This gave \$48,000 net as a working fund. This, used for discounting bills each month at 2 per cent, earned \$960 monthly, or a total of \$5,760 in the 6 months, earning for the contractor \$3,760 in 6 months, a very nice profit on the timber work, which would otherwise have been lost to him.

The discounting of bills means that buying should be done wherever the lowest prices are offered, and a contractor who once gets known for discounting will have very low prices offered him, as many merchants are willing to sacrifice some of their profits for ready cash.

Cash, too, can be used in discounting pay-rolls. As from 5 to 25 per cent discounts are made on this kind of business, profits quickly accrue if the workmen demand much money in advance of the regular pay days.

Even with plenty of capital, a contractor sometimes finds himself in financial straits. He undertakes a new and extensive contract on which large outlays must be made for materials, and then some unforeseen obstacle prevents him from placing them and realizing on his investment. Meanwhile money is needed for other jobs he is carrying on. At other times a losing contract is obtained, and profits vanish and capital likewise. Or the owner of the construction becomes bankrupt and the contractor is not paid and loses his retained percentage.

Preventing Bankruptcy.

Now the contractor faces bankruptcy. What is he to do to keep himself in business? If he can hold his outfit together and get a new job he may within a year or two pay off all of his creditors. Unless a business is grossly mismanaged and beyond redemption, he should not think of going into voluntary bankruptcy. This is the last step and one that may discredit him for future business; yet at times it must be done and an honest man can come out of it with a good reputation, and by hard work and continued honesty get started again.

When troubles of this kind come, the benefit of buying from only a few people is realized. Acting quickly, before judgments and liens are secured against him, he can go to his creditors, state the condition of his affairs and ask their assistance. To illustrate: A contractor was working in Georgia on a railroad and was unable

to collect his money for work done. He had a good team outfit, owed about \$10,000, but was without money and faced bankruptcy. He knew where he could obtain a sub-contract in South Carolina at attractive prices, but did not have the money to move his outfit; and he likewise knew that to attempt to move it out of Georgia would bring attachments on it.

He accordingly took a statement off his books, showing his indebtedness to all of his creditors; and armed with this and an inventory showing the value of his outfit, he went to see his principal creditor, his grocer, to whom he owed about \$4,000. He explained the situation to this man, showing him that his outfit was valuable to earn money on the new job to pay his bills, but that at a forced sale it would bring little toward paying his debts, the list of which he showed. This man wanted his money, not a small per cent of it, so he finally stated that he would see the other creditors and try to arrange to tide over the payments due. Through this creditor all the others agreed to give an extension of time except one man, who had an account of less than \$50. The grocer paid this bill and transferred it to his own account.

Then the two leading creditors advanced enough money to get the contractor to his new job, under an agreement that he would continue to purchase his supplies from them. Within a year this contractor was free of debt and making money. He had a partner, but he acted on his own initiative and told his partner only after he had all the details arranged.

This is known as making a working agreement with the creditors. It can be done in this way through one or two creditors, or through a committee of leading creditors or their attorneys, or by having a general meeting of all creditors. The last method is seldom advisable, as too many brought together seldom obtain results, unless they appoint a committee to work out the details. This method of obtaining an extension of time on accounts can be used in case of an individual, a partnership or by a corporation. Sometimes the creditors may wish to place their own bookkeeper, general manager or financial man on the work, as a protection to themselves, and at times they may even demand a share of the profits, in addition to their own accounts. The contractor can seldom object to these things, for he is attempting to save himself and get a new start, and he must usually abide by his creditors' decision. To have made preferred creditors is an obstacle in deal-

ing with creditors in this manner, as these may stand on their legal rights and block the entire procedure.

Another method, when trouble occurs, is to make an assignment to a trustee, and through him either wind up the business and step down and out, or effect a compromise with the creditors. This compromise is generally spoken of in the business world as a composition. It has been used so often dishonestly that many look on it askance, but there is no valid reason why it should not be used.

Creditors lend themselves to this composition readily and will sometimes propose it, as they think they will obtain more money, as the legal fees and commission are saved. Thus the contractor will offer to settle his bills at 50 cents on the dollar, making a cash payment and the rest in long payment notes. The offer may be larger or smaller than this, or it may be the result of many conferences. If an agreement is reached, the contractor is able to clear for himself all above the amount he agrees to pay and continue his business, after the court has approved the composition. After an assignment is made, it is no longer a matter between the contractor and his creditors direct, as is an agreement with creditors beforehand, for the court's approval must be secured.

If a composition cannot be effected, then the debtor must face bankruptcy. Many merchants, however, will agree to the composition rather than have this, even when it may be against their own interests. This shows how readily compromises may be made if gone about in the proper manner. Business men of experience dread the bankruptcy court, as too frequently they get only a few cents on the dollar for their claim.

Bankruptcy proceedings are never under the state courts, but come entirely under the jurisdiction of the United States courts. Some assignments and trusteeships come under the federal courts and others can come under the state courts. This is also true of receiverships.

If a firm or corporation is doing an interstate business or has a national incorporation, its business comes under the United States courts, but if it is confined to a single state, although it may have creditors in other states, its affairs will come under the jurisdiction of the state courts. However, in the case of out-of-state creditors, in failures, three such creditors can throw the case into

bankruptcy in the federal courts. This then takes precedence over the state courts.

In case of financial embarrassment another step that can be taken is to have a receivership. In some states the concern, either a partnership or corporation, can have the court appoint a receiver or a set of receivers, according to the magnitude of the business, only when it is shown to be solvent, although it may be in financial straits. In other states a receiver can be appointed only for a corporation, which must be insolvent and show in its plea that the receivership is necessary in order to conserve the assets and treat all creditors alike.

A receiver may obtain permission from the courts to carry on the business for a limited time, until a particular job is finished, or even indefinitely. All old claims are at once held in abeyance until the court orders them paid, in part or in full, while the new indebtedness of the receiver takes precedence over the old accounts.

Where profitable contracts are in hand and permission can be obtained to complete them and even take new work, a receivership, under financial embarrassment, is one of the best ways out, although courts often allow handsome fees to successful receivers. But the services of men who can bring order out of chaos and put a business on a good paying basis should be well recompensed. Lawyers are frequently appointed receivers by the courts.

In all these proceedings for holding off creditors and making agreements with them, the action must be prompt and secret, in order to prevent disgruntled creditors from taking steps in bankruptcy against the contractor. Delays and talking may defeat the entire program. Everything must be honestly shown or else criminal actions can follow. The services and advice of an attorney should be secured, otherwise legal mistakes may be made.

Mistakes of a Beginner.

Some years ago a contractor with a great flourish of his pen signed a contract for building nearly a million dollars' worth of railroad lines, when he had only a quarter in his pocket, and was without a bank account. The only other asset he had was a farm in his home state, yet he was able to finance this work and finish the job to the satisfaction of the owners. Naturally he did not finance this on the 25 cents or his farm. He raised money on his

own reputation as a business man and contractor, and on the fact that he had the valuable contract. He also associated with himself men who were able to put up cash, so that ample capital was raised. This incident serves to illustrate how little some men need to obtain a contract and get it started.

The amount of capital needed for contracting must depend upon many circumstances and conditions. The individual himself is a wonderful factor in every business, especially in contracting. One man will seemingly accomplish the impossible, another will fail under the best possible circumstances.

The man who has ample capital, unless he attempts to carry on the most extensive operation, should have but little trouble in financing his jobs; but a man whose capital is limited, or very small compared to the work he wishes to undertake, is the one that will have trouble in raising money and in managing his finances so as to satisfy his creditors and gain and maintain excellent credit.

Another man who sometimes has trouble with financial matters is the one just beginning in the contracting profession. He has gained his experience either in the employ of some contractor or as an engineer in charge of work. He starts out as a contractor, and obtains a job amounting to about \$3,000. He has enough capital to run such a job even if he does not receive any money until it is finished, but his contract provides for monthly payments and the contract time is 100 work days. In such a case the financial problem seems a simple one, yet in many cases the contractor spends more money than necessary.

Naturally the beginner must buy tools and such machinery as the job demands. These are not a direct charge against the job, except those small tools that are likely to be used on the first contract. The larger tools and machines will be used on a number of jobs. The contractor, however, must earn enough on the job in hand to pay interest on the investment, the cost of repairs and renewals and the depreciation. The repairs and renewals on the first job, if good machinery has been purchased, should amount to but little; but the depreciation due to the fact that the machinery has become second hand is considerable. That is, the selling value of the machinery at the end of a three months' job will be about the same as at the end of a year's job. Due to these reasons, an average depreciation charge is made against the plant, or an arbitrary

charge is made based upon the average depreciation as experienced by other contractors.

Tools and machines that will save labor and time should be purchased for the job, but great care should be exercised not to buy more than are actually needed. There can be two damaging results from overbuying: first, the plant charge against the job will be greater than it should be, thereby reducing the profit; and second, the capital is correspondingly reduced, so that if a second contract is obtained before the first one is finished, the contractor may find it necessary to borrow money to carry on his job, whereas if he had not bought so extensively he would have money of his own to carry on his work. Thus he is losing interest on some of his investments and at the same time may have to pay interest on borrowed money.

An Expensive Office.

So it is with other items of expense. A man feeling that he has gotten his start in a new line, makes his office and general expense items too high. He rents an office in a large office building; he buys good furniture; he employs a bookkeeper, a timekeeper and a stenographer, and makes his other general expenses in proportion to them. For a \$3,000 job, such expenses should seldom exceed \$50 per month, while an outlay such as has been described will be at least \$150 per month. Instead of these things, one man can be employed for the office, and he and the contractor can attend to all of this work. An office can be rented close to the job, an unpretentious room or building, that can serve also to store materials and tools. Thus the contractor and his assistant will be near the job to give it their personal attention. This may mean a saving in the cost of supervision, as with a good foreman or two the contractor can be his own superintendent, getting better results than are likely to be obtained from any superintendent at \$100 per month, certainly the maximum amount that a \$3,000 job would admit of paying.

Some contractors state that they cannot afford to have a poor office, that it is like so much additional capital to them to have a well furnished and properly equipped office in a good location. There may be some truth in this for a contractor who is well established, and handling a number of large contracts; but it must be remembered that the man carrying on small operations or just

beginning work does not have many people calling on him to give him jobs. The frequenters of his office are likely to be people who wish to sell him goods, or laborers after their pay, and these will find him wherever his office is located.

The laborers care little about the office and this is also true of merchants wishing to sell. The latter are more interested in selling their goods and receiving their pay promptly than in any mahogany furniture that the contractor may have in his office. The main thing is to keep the office clean and in order even if it is in a board shack. Many contractors who have offices on their jobs fail to keep them clean.

Many successful contractors have offices only on their jobs. If they have two or three contracts they maintain their main office on the most important job and have sub-offices on the others. When the main job is finished the main office is moved to the next most important contract.

Making Profits Vanish.

It is these needless expenditures that sometimes eat up all the profits on a job. Cost records of work done will show a profit, but the overhead charges are made so high that nothing is left of these profits. This is sometimes the case for large contracts and can easily be so with small jobs, as the total sum of the profits cannot be large and any unnecessary drain will make them disappear.

A man beginning a new business with insufficient capital may make the same mistake, but he is not so likely to do so, as he is short of funds. He may do without an office, using his home as his office address. He may be his own timekeeper, bookkeeper and letter writer, as well as his own superintendent. This man's mistake is likely to lie in not spending enough money, especially for tools and machines. He is likely to attempt to do by hand methods much work that could be done at a much lower cost by machinery. Some men will try to deceive themselves by saying that certain classes of work are done only at odd times, and men are placed at such work only when there is nothing else to do, so that the machine will only add to the cost of the job. There may be a few times when this is true; but in ninety-nine cases out of a hundred it is not so. In most cases, if these odd jobs as well as the regular work were done with the proper plant, fewer men would be employed. Recently the author saw this proved by seeing

two forces working the same day on two different jobs, each about the same size and of the same class of work. One, properly equipped with plant, had only three men on it; the other, using only hand methods, employed about a dozen men. In addition to this saving, the first job was finished in a few hours' less time.

The question resolves itself into one of finance. Will the charge for the machine equal the amount paid for the extra labor, caused by not having the machine? In addition, the machine may allow the job to be so systematized that other work may be improved upon and carried on at a lower cost. This is especially the case on small concrete jobs using a mixer, instead of mixing on boards by hand.

The plant charge for the use of a mixer may be \$50 for a short job. If this saves three men at \$2.00 per day for only ten days, the mixer should be placed on the job, as the saving thus effected means much in actual cash, while the plant charges consist of interest and depreciation, simply department charges.

If the contractor has not the money to purchase the machine, he is in an awkward position, but he has several courses open to him. First, his credit standing may allow him to purchase it on open account. If this is not possible he may be able to buy it by giving his notes for it. The job itself may be long enough to allow him to earn the money to pay for it. If it cannot be purchased by either of these methods, then it may be purchased on lease-sale agreement. Lacking this, a machine may be rented. The rental price is figured against the saving in labor that can be effected. Another expedient that may be tried is to borrow the money to purchase the machine at a cash price. This may be done by a note from a friend, by giving security to a bank, by selling an interest in the contract, or by giving an order on the owner of the work on the retained percentage that has accrued. It is a case where a man must use his ingenuity to place himself in a better position to earn money. It is not a question as to whether a profit is being made on the job, for this might be done by hand methods; but instead whether or not all the profit possible is being made, and this can seldom be done without adequate plant of the right kind.

These are elementary propositions of financing contract work, and are given as illustrations for the beginner and others, for there

are many men who have been contracting for some years who continue to use hand methods at a high cost, instead of machine work.

Amount of Cash Capital Needed.

The needs of ready cash on contract work are for the following general purposes:

- Purchasing tools and machinery.
- Purchasing construction materials.
- Purchasing supplies.
- Paying labor.
- Paying office expenses.
- Paying freight.
- Cash for incidentals.

The amount of money needed for these purposes will vary greatly with the size of the job and the character of it. The purchase of plant is dependent upon the size of the job, and the character of the plant upon the classes of work that must be done.

Construction material is purchased extensively for some kinds of work, such as concrete jobs, and but little for others, such as earthwork. The amount of supplies varies with the size of a job and the amount of machinery used. Then, too, merchandise, considered as supplies, will be bought if a commissary is run for the workmen, and other supplies if the workmen are fed by the contractor.

Labor must be paid promptly when the money is due. A merchant can be kept waiting for his money for some weeks or months, without bad results, as he will hardly sue until he has attempted to collect his money himself and with the aid of an attorney or collection agency. Even if he does sue, it takes a judgment or three creditors acting together to throw a man into bankruptcy and stop his business. On the other hand, to fail to pay a large number of workmen means to be discredited at once by the laboring class, and if a contractor cannot get laborers, his work will come to a standstill. The care of laborers, especially in regard to their pay, is one of the most important things a contractor has to consider. The laborer is worthy of his hire and should be paid on time and not be put off, even for a few days.

Formerly, the consideration of the pay roll was not a great problem for most contractors. In many sections of the country, outside of the large cities, it was once the custom to pay laborers

but once a month. The contractor had his estimate taken up on the first of the month. He received his pay for this from the tenth to the fifteenth of the following month and paid his men between the fifteenth and twentieth. Thus if the estimate was a good one and the contractor was making a profit on the job each month, the men themselves really provided the money for the pay roll. Today, this has been changed in many parts of the country. The contractors, to a great extent, are still paid once a month, but they are compelled to pay their laborers either weekly or semi-monthly. This has been caused in some places by laws compelling employers to pay their men at stated times, or by competition among contractors in getting and holding workmen, men being obtained by promises to pay off at frequent intervals. Thus it becomes necessary to have cash enough to pay the workmen until the contractor receives his first payment. When a contractor is paid monthly and begins a job about the first of a month, he must provide himself with cash to pay his men for a period of six or seven weeks. There must always be provided enough money to pay discharged men. Some unions compel employers to pay discharged men for the time between their dismissal and the time of paying, so it becomes expensive to keep men waiting for their money. In the state of New York it is possible to start criminal proceedings against an employer for not paying his men.

To handle laborers today in contracting takes much more money than formerly, so that a contractor's capital must be larger than was once necessary to carry on work.

Every one in the employ of a contractor can be classed under the head of labor, but in considering financial matters, there are some distinctions made. The employes in the office are considered under the expense of the office. Superintendents, general managers and other directing officials are considered under the item of superintendence. The rest of the employes are grouped under the general item of labor.

The paying of the office force has been considered under labor, but there must be funds provided for postage, for traveling expenses, and other incidentals pertaining to the office and general expense items. Thus new jobs are to be bid upon at short notice and there must be cash to cover the expenses of visiting the work and making up and submitting the proposal.

On jobs where much material and large amounts of supplies

have to be purchased, the freight on them for a month, or from one estimate to another, may amount to many hundreds of dollars. This must be cash, as few railroads will extend credit for freight unless a bond is made to cover it. It is expensive to have shipments, that may be needed for the work, held up because the contractor cannot pay the freight bills.

Money is also needed for many incidentals in connection with the job and for the living expenses of the contractor and his family.

Purchasing Tools and Machinery.

Much has already been written as to means of obtaining plant with limited capital; it now remains to give some details of the various methods. If a contractor's credit is good, small tools and inexpensive machines can be purchased on open account. Even if his credit is not of the best, it is generally possible for him to obtain a limited amount of such things on open account. That is, a merchant may allow a credit of \$200, refusing to sell more until something is paid on the account. If a man cannot secure credit for even so small a supply, he must then use cash. Some cash purchases and the fact that he has a contract should then secure him a small line of credit.

For larger purchases of machines, with only limited capital, time is saved by making arrangements regarding payments when the machine is ordered, otherwise shipment is not likely to be made promptly. If a machine is not purchased on open account, a cash payment is generally made at the start. There are some exceptions to this. Some expensive machines are sold with a period of free trial, say 30 days, when the full purchase price is demanded, unless different arrangements are made. If notes are given for a purchase, it is customary to pay from one-third to one-half of the price down, or the machine is shipped "bill of lading attached" and a sight draft drawn for that amount. The same is true when buying on lease sale agreements. Notes are then made payable in 30, 60, 90 and 120 days for the rest of the purchase price. In most cases these notes will bear interest, adding to the cost of the machine. To prevent this, have a price named on the machine and then insist that this price cover the whole transaction, as interest even at 6 per cent per annum quickly runs into a considerable sum of money.

The notes on the lease sale are secured by the sale agreement, the ownership remaining with the seller until the last payment is made, but with ordinary notes security is not given. As a rule, notes are seldom given for a period longer than 6 months and few notes for over 120 days are negotiable.

A sharp trader with limited capital can drive a better bargain than this. It is possible to make a cash payment of only one-fourth of the price and divide the rest into 6 monthly payments. There have been cases of paying but one-fifth of the price at the time of purchase and dividing the rest into 9 monthly installments. Thus the price is distributed over about 10 months. Such arrangements are very favorable to a contractor, for he is able to earn these small monthly payments with the machines. As the notes fall due, if they have not already been discounted by the seller, they are placed in a bank for collection.

Sometimes, after a few of the notes have been paid, it is possible, if arrangements are made before the next note falls due, to have the payment deferred a month and the rest of the notes extended for 30 days. When notes are given for monthly payment and a 6-months note for the rest of the price, the purchaser should state when he signs the note that he desires to have the last note made into three, for 30, 60 or 90 days, when it falls due. By these methods, additional time is gained to earn money to meet the obligations.

When plant is purchased in this way, it is well to buy as much as possible of it from one concern; then arrangements are made with one party only and not with a large number. Both new and second-hand machinery can be bought in this manner, but if new machinery is purchased it is possible to purchase all the plant from one dealer only in exceptional cases. One manufacturer, however, will often purchase a machine from another manufacturer to sell to a contractor on lease sale agreement in order to effect a sale of his own products. Thus, in order to sell a stone crusher, a manufacturer will purchase an engine and boiler to run it, the notes being given to one party.

Some plant is sold on installment payments and a mortgage taken on it; then monthly mortgage notes are given. These mortgages are generally recorded both at the home of the seller and also in the county in which the contractor is working.

Thus if a contractor intends to buy machinery to the value

of \$10,000, he will need in actual cash, under the most favorable conditions, about \$2,500 to make the first payments. If all of the machines are not needed in the first month or two, some of the purchases can be deferred and less money will be needed at the start for this purpose. It is a poor policy to buy a machine before it is needed, for not only must the first payment be made on it, but several other payments may fall due before the machine earns a cent of money. A man with limited capital cannot afford such an extravagance, yet this is frequently done. It is necessary to have machines on the job by the time they are needed, but if the work is managed properly they can be there a few days or a week instead of several months ahead of time. A man with limited means must make his head do much that others use money for, as anyone with plenty of money can obtain things they need at any time.

In purchasing plant, it is not safe to count on such a small original investment, as it frequently will take more, but the sum mentioned is certainly the minimum.

There are two methods of renting plant. One that is largely limited to certain types of excavating machines is to pay rental on the yardage moved. Thus the machine is an expense to the contractor only when it is working and earning money. Outside of the freight, the machine is placed on the job without cost to the contractor, and as he can generally arrange to pay rental when he obtains his monthly estimates, the machine provides for itself and cash is not needed at the start.

The second method of renting is by the day, week or month. Different classes and types of machines bring different rentals. In most cases, the first month's rent is paid in advance, and actual cash is needed for this and for the freight. The amount of money needed will depend upon the number of machines rented, but it is safe to place the sum at from \$500 to \$1,000. In renting plant the contractor is responsible for the safe-keeping and must maintain it and, under some rental agreements, must keep the outfit painted and the owner's name on it legible.

Purchasing Construction Materials.

On some construction jobs but few materials are needed, while for others thousands of dollars' worth of such things must be purchased. These must be bought in such quantities, stored on

or near the job, that delays will not occur while forces are waiting for materials. A man with ample capital and the best of credit will have little trouble in obtaining ample supplies of all necessary materials, for he can order these things at any time. To the contractor of limited means, however, it becomes quite a problem.

The first suggestion that may be given on this subject is not to overbuy and not to purchase too soon. If a time schedule is made for the job and this is revised as the work progresses, materials can be bought in time to prevent delays and yet not received months before they are to be used. When deliveries once begin they should be timed so that the contractor does not buy more than enough for immediate needs. To have large amounts of supplies on hand increases the cost of storage and rehandling over that required by having only supplies enough to keep the job going. Deterioration, and fire losses for some classes of material, is also reduced.

If large amounts of supplies are on hand, they must be paid for before they are used. These are the things that worry many a contractor. It would seem that only a foolish man would place himself in such straits, but it is a fact that many contractors, who would otherwise have little trouble, bring much worry upon themselves by overbuying and premature buying. A few years ago a young contractor ordered six carloads of cement, nearly 1,000 barrels, hauled them and stored them, when it was not possible to use more than 10 or 12 barrels for six or seven months. Before he got this cement paid for, he had troubles of the worst kind. Besides this, he had paid out in actual cash 50 cents a barrel, \$500 in all, for hauling the cement over a long stretch of bad road through the mountains. This money was badly needed for other purposes. The same contractor had also purchased cast iron pipe to the amount of several thousand dollars, when but little of it could be used or hauled to the site where it was to be placed. Consequently he had to build a storage yard and pay the cost of rehandling later. Again cash was paid out for hauling and handling, in all about \$300. If the purchase of this pipe had been deferred from the fall of the year to the later part of the winter it could have been hauled on sleds on the snow for one-half the money and would have been on hand in ample time to be placed in the early spring. The demand for payment on this pipe was

the cause of throwing this man's company into the hands of a receiver.

Construction materials are generally purchased on open account. The seller is secured in most states by laws, which allow him to place liens on the property in case the contractor does not pay him. These liens will hold in most cases, unless the owners of the property become bankrupt, then the priority of the liens placed counts. However, merchants and manufacturers are not looking for settlements of this kind. They want their money promptly and not after long legal entanglements. The placing of a lien, however, is a protection to them. Labor liens take preference to liens for construction materials.

A man's credit may be good enough to start buying materials for a new job on open account. As stated before, the fact that a contractor has a new job may give him enough assets to do considerable buying. After the job has been running several months additional credit may be refused the contractor. There are several ways of handling such a proposition. Notes may be given for the bills past due and new materials bought "bill of lading attached" and paid for with money in hand that would otherwise have been used for paying the old bills. If the contractor is entirely without funds, other methods must be resorted to so that new supplies can be obtained.

Some contracts for construction work provide for prices and payments monthly for materials delivered. This is a great help to the contractor. If such payments are not provided for by the contract it is often possible to arrange with the owner or his engineer to allow for monthly payments for materials delivered but not yet placed. Such payments are generally made on a basis of from 50 to 75 per cent of the contract price for the material in place. This is enough, as a rule, to cover the cost of the material delivered, and with this money large amounts of supplies can be kept on hand and the bills paid monthly. The fact that the owner is legally responsible for paying for these materials will cause him to pay monthly for those delivered.

Another method of arranging to pay for construction materials, with limited means and indifferent credit, is to make an agreement with the seller to ship the materials as ordered, the contractor to pay the freight and haul and store them, but the goods to remain the property of the seller until actually used. At the end of each

month an inventory of the stock on hand is taken and payment is made out of the monthly estimate for the materials actually used. Under such an agreement the contractor is responsible for anything that is injured or stolen. This kind of an agreement is very unusual and can seldom be made with a merchant or manufacturer at the beginning of a job, unless he is very anxious to sell. After he has once started to furnish his goods, however, and the contractor is already indebted to him, such arrangements may be made. The seller is amply protected in this way, for in case the contractor fails, all unused materials are the property of the seller and can be taken back by him. He can place a lien on the property for all materials that have been used. The prices paid for materials purchased in this manner may be slightly higher than when they are bought on open account, but under such circumstances it is necessary to pay the price, considering it as about the same as interest that would be paid on borrowed capital, if it could be obtained.

Even these methods may fail to secure the materials that a contractor needs and other expediences may have to be resorted to in order to keep him going. These will be considered in connection with purchasing other supplies.

Purchasing Supplies.

There are many kinds of supplies needed for construction work in addition to the materials that enter into structures. Such supplies may consist of coal, oil, lumber, explosives, and many other necessary materials that enter only indirectly into the work. Besides these, if a contractor keeps a commissary, he has to buy merchandise to sell, and if he boards his workmen there are supplies of food.

The merchant selling these supplies to a contractor is not in the same position as the one selling construction materials, for he is not protected by law in being able to place a lien on the structure being built. Liens have been placed on construction work for such supplies sold to and used by contractors, and such liens have been sustained; but courts today are ignoring these precedents as being unsound law, and in some states special laws prohibit liens, except for work done and construction materials furnished. This puts a different aspect on this business.

Such supplies are generally bought on open account, the terms

varying from 30 to 120 days. With fair credit a contractor should be able to handle such accounts if he does not overbuy for his present needs. It is necessary to know how goods are sold and upon what terms. It is evident that if a man buying \$500 worth of goods that are ordinarily billed at 120 days pays for them at the end of 30 days, he is using up \$500 of his ready cash that would help him to meet pressing bills that are actually due. He is also not giving himself the opportunity of using these supplies and thus earning the money to pay for them.

To stock a new commissary it takes at least \$1,000; these are goods that are generally sold on 30 and 60 days' time. Groceries are sold on 30 days and dry goods on 60 days, although on the latter it is sometimes possible to get the bill dated some weeks ahead. Shoes are sold on 60 days, but the tendency today is to reduce this to 30 days. Rubber goods, such as boots, are sold in the spring and summer with the bill maturing about December 1; but during the autumn and winter only 60 days' time is given.

For food stuffs to board men, with a force of 100 men or less, from \$500 to \$1,000 will be needed for the first four or five weeks. As the goods are sold at a profit and the foodstuffs used to feed men who are charged for their boards, these accounts, after the first estimate for work done is received, should take care of themselves. That is, the money received should purchase new supplies, and with the profit made additions can be made to the stock, or the profits can be used for other purposes. A good commissary and boarding house run by a contractor is frequently a great assistance to him in furnishing funds to run his work.

The supplies needed to keep the work going are on a different basis. They are incidental to the job and there is only an indirect return. With limited credit it is sometimes difficult to obtain them. Bad weather prevents work being done, but the bills must be met just the same. Some of these supplies, such as coal and lumber, are sold on 30 days' time, while more advantageous terms can be secured on others, such as explosives and hardware. Hay and grain for mules and horses must be provided in plenty so that these animals will be able to do good work. Such goods are sold on 30 days' time, but, although it is stated that the margins on them are very close, cash paid on the bill of lading generally secures a large discount, so that these goods should be bought for cash if possible. If this cannot be done, the ordinary prices must be

paid. If goods are to be secured as they are needed, these bills must be met promptly. Feed dealers press payments quickly and in many cases have thrown contractors and other concerns into bankruptcy or the hands of receivers because they did not meet their bills when due. A contractor must see to it that his horses are fed. It is sometimes possible to pay for the heavier supplies as they are used, in a manner similar to that described for purchasing construction materials. A fairly large supply can be ordered and stored and monthly payments made over a period of 3 to 4 months. If too large a supply is not ordered, this allows money to be earned in time to meet the payments.

When it is not possible to do this, the contractor who cannot meet his bills promptly is in an awkward position. He must give some form of security to those from whom he is purchasing and to do this he must buy from as few firms as possible. Giving security, if it becomes generally known, may prevent him from buying from those he does not secure. This giving security is making one or more preferred creditors; this subject has already been discussed.

Few contractors with limited capital have much security to offer. A mortgage may be given on his home, if he owns one, or on his plant, horses and small tools. In giving the last-named mortgage, care must be exercised not to include any plant bought on lease sale agreement or by mortgage notes, which has not been entirely paid for, as it is a criminal act to mortgage such goods. If money can be borrowed by giving such mortgages, the contractor is placed in a position to buy where he pleases and can obtain better prices and terms, but banks can seldom lend money on such securities. Trust companies and national banks are prevented by law from doing so. Savings banks and small country banks chartered by states, and private banking houses can lend money on such securities. It is to these banks that application must be made. If money cannot be borrowed from banks, then the contractor must turn to a personal friend, or to a note broker in a large city. These brokers not only demand security, but also discount the notes on a heavy interest basis. Many men in business, who have been hard pressed, raise money in this manner, but the cost is excessive and the broker is seldom lenient if the notes cannot be met promptly.

Sometimes a retired business man will lend money, after investigating the merits of the case, taking a mortgage to secure

him and a bonus at the end of the job or an interest in the contract and outfit. The contractor runs the work and relies on the capitalist for any ready cash he may need. He will also have the advice of this successful man in managing his finances.

Failing with these methods of raising money, the contractor must turn to his largest creditors. He uses his ready cash to pay his bills and then pays what he can on account on his large bills for supplies, and gives a mortgage to secure the amount owing and to cover new purchases. These mortgages must be recorded, but it is surprising how few business men have such records looked up. If a contractor is discreet about his business, he may keep secret such transactions for some months. If not, he will be compelled to give orders to merchants on his monthly estimates. This, however, is a bad practice, as he may then find himself short of money to pay his labor. A better way is to give orders on his retained percentage, as this keeps his creditors off until his job is finished.

A contractor having a sub-contract from a general contractor may often get assistance from him without resorting to these expedients.

Some idea of the money needed to take care of the buying and supplies of all kinds can be drawn from these remarks. Certain classes of work, such as concrete construction when it is undertaken alone, call for a large percentage of the total cost in materials and supplies. Thus, for a contract amount to \$100,000, the materials and supplies will more than likely equal 60 to 70 per cent, that is, from \$60,000 to \$70,000. Divide this by the number of months the job is likely to last, and the amount of money needed for one month should be more than ample to carry this part of the work.

Some jobs call for few materials and the materials and supplies are not likely to run over 25 or 30 per cent of the total contract price. For most jobs, such as railroad construction, canals, and many other kinds of structures, it is safe to figure nearly 50 per cent of the total contract price, especially if the men are boarded by the contractor and a commissary department is maintained.

Paying Labor.

When the contractor is boarding men and selling them goods from a commissary, the amount of money needed to pay labor is

less than when the contractor pays straight wages and the men find their own accommodations. This alone may affect the amount of cash needed on a job, both for labor and for supplies. It is possible with a pay roll amounting to \$3,000 or \$4,000 per month to have charges against the men for board and goods amounting to about \$1,000. From 20 to 30 per cent of this sum may represent profit; so, although the amount of supplies needed will be greater, the actual cash needed for running the job will be less, as the contractor, besides making a profit on his business, has a longer time to pay his bills for supplies than for labor. This shows two advantages of doing business with employees.

No matter how frequent the pay days for the men may be, there must always be some cash on hand to pay labor; for men want advances on their pay, others leave the job, and some are discharged. It is sometimes possible to do a fair business for cash in the commissary and to use this money to make advances on men's pay, that is, to discount time. Although not all contractors follow the custom, it is quite general, in most sections, to make men pay a discount for the money advanced to them between pay days. The most common practice is to charge 20 per cent discount, but some contractors charge only 10 per cent, especially to the better classes of laborers, such as mechanics and machine runners. Thus the money earned in the commissary again earns a handsome profit in discounting labor bills. If a contractor has ample cash he can often use much of it to advantage in discounting labor, especially if pay days occur monthly. One man, seeing another get money, experiences a desire to have some himself.

If, however, a contractor has but a limited amount of cash, he can keep such advances to the minimum. Men who leave their jobs and wish their pay can be paid at a discount if the cash is available for this purpose; if it is not, they can be given a due bill, or a certificate of their time, which should be paid in full on the proper pay day. A man leaving a job of his own accord cannot force payment of his wages until they are due, except in a few states.

It is different with a man discharged. He must be paid at once, and some labor unions enforce payment for their members for all time after being discharged until they receive their pay. For this purpose some cash must be kept on hand. The amount needed is always difficult to estimate. If men are easily obtained, it pays to discharge workmen who are negligent, disobedient, or

inefficient, and 10 per cent of the gross pay roll may be needed at all times for this purpose. If men are difficult to obtain, some faults in them must be overlooked. If money is likewise scarce, inefficient workmen need not be discharged; instead, their wages can be cut to such a rate as will allow the contractor to make a profit on their labors. Under this treatment, some of the men will stick to their jobs while others will leave; but as they do this of their own volition the contractor does not have to pay them until his regular pay day. This greatly reduces the money needed for paying off men before the regular time.

Charges for medical attendance and similar requirements of the men will further reduce pay rolls. If men are paid but once a month, the pay day can be set a few days after the contractor receives his monthly estimate, so that the men earn their own money for the payroll. It is still possible to pay monthly in some places; in towns and cities, however, weekly pay days are the custom, and in the country in most states and in Canada weekly or semi-monthly pay days are either demanded by the men or made compulsory by law. Contractors, however, are still paid monthly estimates.

Thus, in addition to the sums of money needed between pay days, the contractor must make provision for the money needed on each pay day that occurs before he receives his first monthly estimate. For semi-monthly pay days this means half of his labor bills for the month, while for weekly pay days three-quarters of the monthly sum will be necessary. On some jobs, where large numbers of men must be employed at first and the number is afterwards reduced, the contractor cannot take his average monthly pay roll as a guide, but must add to the sum. There are other jobs that will need fewer men at first than when the work gets well under way.

For most jobs it is possible to estimate the number of men that will be needed monthly, and by applying their rates to this number, to approximate the monthly pay roll. From this the semi-monthly or weekly pay roll can be obtained.

Another method of approximating the monthly pay roll is to estimate it from the total amount of the contract. For instance, if supplies and materials amount to about 50 per cent of the job, labor will take up the rest, except about 5 per cent for overhead charges.

To illustrate: For a job amounting to \$100,000, there must first be deducted about 10 per cent for profit, leaving \$90,000. From this, 5 per cent, or \$5,000, is taken for overhead expenses, to be considered later, leaving \$85,000 for materials, supplies and labor. This gives from \$40,000 to \$45,000 for both materials and supplies and labor. Supposing that the job will last twelve months, and setting the labor at \$45,000, a pay roll of about \$4,000 must be met monthly. This gives \$2,000 for a semi-monthly pay roll and \$1,000 for a weekly pay roll. These two methods can be used as a check against one another. The author has used the last method frequently. It is also possible to get a fair idea by using old payrolls of similar jobs when the rates of wages, as well as the number of men worked, are about the same. Even when these details vary, the old rolls can be used as a guide.

What has preceded shows the necessity of making up pay rolls. They are part of the bookkeeping and should be treated as such.

Office Expenses.

The amount of money needed for office expenses is dependent upon the magnitude of the jobs being carried on and the ideas of the individual as to the style of office he should maintain. The salaries paid can be considered under the labor item. This reduces the sum needed considerably. Rentals in large cities and towns are generally paid in advance, so that money must be provided for at least one month's rent. Supplies, such as stationery and forms, can be bought on open account and paid for every 30 days, the same as other bills. Thus under this head the rental of the office, telephone service and small incidentals, such as telegrams, postage, etc., must be considered.

The cost for these items during the job should not exceed 1 per cent; due economy should keep it under this.

Paying Freight.

Paying freight is an item that means ready cash; for even if some credit is extended, it is only for a week or two. It has been previously explained that some railroads will extend limited credit for freight by having the contractor furnish a bond or similar security. At times, in small towns or at country way stations, an agent on his own responsibility will allow shipments to be taken without the freight being paid, as an accommodation to the con-

tractor, and possibly will allow him to make settlement once a week for all freight received. In such cases a contractor should stand by such an accommodating agent, as the latter would have to pay such bills himself if for any reason the contractor should fail to pay them.

Naturally, freight is an expense that is not kept separately, but is added to the cost of materials, supplies and other items; it is being considered separately because it is a cash item. Freight charges, too, are the heaviest in starting a job; for within the first two months the plant and much heavy material, as well as a large assortment of small supplies, will be received for the work and the freight bills will have to be met. On some jobs from a quarter to a third of all the freight paid on the job may have to be paid out during the first two months. Afterwards the freight for each month may be light.

It is a difficult matter to estimate the money needed for this purpose. The author's experience is that from 2 to 3 per cent of the total amount of the contract will be needed for paying freight. When this is proportioned to each month, the sum for the month should be at least doubled for the first two months, and even then it may not be enough.

Sometimes it is possible to have merchants and manufacturers who are furnishing goods prepay the shipments and charge it on their bills. With limited cash this is of great assistance, but few merchants will do it unless freight is being received at a railroad station where no agent is stationed. Some railroads give contractors doing work for them a very low rate on all freight; this saves much money and cuts down the amount of cash needed.

Incidental Expenses.

Incidental expenses are part of the overhead charges and consist of various items, such as traveling expenses, money for insurance premiums, and other incidentals. The money for traveling expenses comes under two heads. First is that used for traveling from the home office to obtain new jobs and start them. This is for the contractor and his leading men. The other money for traveling is to bring men to the work. As the men pay this back by their labor, it is an item that is charged directly to the labor account, but as cash must be on hand for this purpose, it must be considered under the head of incidental expenses. For work in

cities this item is generally eliminated, but for large or small jobs in the country it is necessary to bring in laborers. The amount of money needed for this purpose depends upon the number of men wanted for the job, and the distance they must travel. Some contractors have the expense of bringing laborers to their work throughout the life of the job. This is caused by several things: deceiving the men as to the work and the pay; not treating them properly after they arrive on the work; and furnishing them poor accommodations and food. The little that is thought to be saved in this manner is more than offset by the expenditure to bring in new men, and the losses sustained by having men run away before they have repaid their transportation charges.

The amount of money needed for this purpose can be kept to a minimum by treating men fairly and working them properly instead of driving them. To start a job where 100 men are to be worked, it is well to count on at least \$10 to the man, thus setting aside \$1,000. More money than this may be spent on some men, but a number may be secured at the work, while in some cases this sum of money may secure more than 100 men. However, the money needed for transporting men may be deducted from that set aside for payrolls.

The money for insurance covers premiums on bonds, fire insurance and employers' liability insurance. These are all necessary during the first month of starting a job. The cost of such things will generally equal about 1 per cent of the total value of the job, so for a \$100,000 contract about \$1,000 will be needed, if the job is finished within 12 months. In this case the cost may come in a lump instead of being distributed over the entire period of the job.

A word as to liability insurance. The premium paid at the start is based on an estimated pay roll. Under the heading of "Paying Labor" the methods and need of estimating pay rolls were discussed. Another use of these estimates is in obtaining insurance. Various rates are paid for different kinds of work and men are classed under different heads. These rates vary from a little over 1 per cent to 7 or 8 per cent. The premium is then figured on the amount estimated to be paid to laborers on the entire job. This premium can be paid in one sum, or, in some cases, monthly. At the end of the job the entire transaction is checked up and adjusted, a rebate being made to the contractor if he has overpaid, and any deficit being made up by him.

Making payments monthly saves cash in starting the job, so that this method of paying is to be preferred over a lump sum when the insurance is placed. Bonds and other forms of insurance are paid for in cash when they are taken out. This makes some cash for these purposes necessary when a contract is started.

A contractor's living expenses must also be considered, for he must have cash for himself and family between estimate days. If a contractor doing work in the country lives with his family in camp, but little money is needed for this purpose, as food and most clothing can be bought wholesale and paid for with other bills. If a separate establishment for his family is maintained in a town or city, additional money must be provided. Scarcely anyone can tell another man how he should live, but a man whose capital is limited should not allow his family to be extravagant, nor should he spend money recklessly himself. Extravagance not only uses up money that he needs in his business, but also injures his standing with his creditors.

A man making money is at liberty to draw such money out of his business as he sees fit; but if capital is scarce, his living expenses should be gauged by his earnings. It is well to draw out a weekly or monthly allowance or salary that will comfortably meet the needs of himself and family. If there are partners, each can have a drawing account, which can be charged against his ultimate profits.

If the business is done by an incorporated company, a drawing account should not be allowed, for in case of bankruptcy each stockholder or director can be held legally responsible for such sums as he has drawn out, and can be compelled to make the sum good to the corporation. These men should be paid salaries by the corporation for their services, as is done with other employees. This is legal. As profits accrue, the directors can pass dividends to be paid on the shares of stock held and can set aside a surplus as additional working capital.

Drawing accounts for partners and salaries for officers of corporations should be reasonable, for a limited business varying from \$100 to \$200 per month.

Examples Showing Capital Needed.

After considering each separate need for cash, it is possible to outline the actual cash needed for starting a job, say for \$100,000.

It is a significant fact that the man, firm or company enjoying first class credit can get along with less cash than can one whose credit is indifferent. With excellent credit, most plants can be bought on open account. Very expensive machinery, which may call for cash, will not be considered, as we will place the cost of plant for the job at \$10,000. The same is the case with construction materials and supplies, open account purchases will be made, although several thousand dollars could be used to discount bills to advantage, and money could also be saved on purchases of plant by having ready cash. About \$2,000 will be needed for the semi-monthly pay roll. For office expenses, bonds, insurance and like things about \$500 will be required; another \$1,000 will be wanted for freight and \$500 for incidentals. This is a total of \$4,000, and \$6,000 or more could be used.

For a new man at contracting or one with indifferent credit, more money will be needed. With \$10,000 worth of plant to purchase by lease sale agreement, he will want \$2,500 for this purpose. He will need \$1,000 for materials and supplies. He may need more, but with this amount and other money he expends, he should, on the start, be able to establish some credit for himself. For a semi-monthly pay roll, he will need \$2,000. For freight he must have \$1,000 and for office expenses and incidentals, \$500. It may be possible to get along with this amount for the last two items, although another \$500 may be necessary. This gives a total of \$7,000 to \$7,500. Such figures as have been given can be only a rough guide.

This can be illustrated by citing some actual cases. The author knows of one railroad contract for \$100,000 that was started with only \$3,000 in cash. Pay rolls were paid monthly, and from time to time small loans were secured to assist, but the work was put through on this sum, and another smaller job was started.

On another job, a sub-contractor completed a contract for about \$30,000 worth of work, and had absolutely nothing to start with, not even good credit. His general contractor paid his pay rolls at first and bought tools and supplies for him, taking the bills out of each month's estimate and charging him 10 per cent on the invoice prices. Even with this, the contractor finished the job with about \$1,800 in cash as profit and an outfit valued at about \$1,200.

On the other hand, another man started a contract for about \$20,000 worth of work with about \$700 in cash and tools, etc., to

the value of about \$600, yet his creditors put him out of business before the job was finished.

Another contract for about \$200,000 worth of work was started with a cash capital of \$15,000.

In another case a contract for more than \$1,000,000 was started with \$100,000 and, although money was borrowed to carry it along, it was finished on time and a handsome profit made. The author could cite many examples showing how contractors have made a success of large contracts with small capital, or but little actual cash, while others with seemingly ample capital have failed.

Banking Arrangements.

Not only does the success depend, to a great extent, upon the individual handling the finances, but also upon the arrangements made with banks and bankers. These arrangements will likewise depend upon the ability of the individual.

Banks make money by lending it to those who need it. There are three classes of banks; national banks, chartered and controlled by the national government; state banks, including saving institutions, which are chartered by the state governments; and trust and deposit companies chartered by the state governments to do a banking business besides acting as trustees for estates and performing other legal functions. Under the state banks come the private banking houses. The limitations of the methods of these various kinds of banks for lending money are placed upon them by the governments granting their charters. Their loans are controlled by laws, varying in different states and with the different kinds of banks.

Savings banks, in most states, will accept real estate as security for loans, while other banks will not do so. However, loans can seldom be made quickly on real estate. Time must be taken to search titles and also to view the property. In other cases, certain classes of stocks and bonds are excluded as security. Few banks will make loans to new depositors without some form of suitable security. After having transactions with a depositor, not so much security is demanded and it even becomes possible to borrow money, in some cases, on a personal note without security. In the larger cities this is not always true, for there a great deal of sentiment is cut out of business.

A bank in many cases will discount a note for a depositor, when they will not loan money to him on his own note. The reason of this is that on a note discounted two men or firms are held responsible, thus making it equal to a note with an indorser.

Some bankers, to obtain depositors and retain them, do much advertising as to the accommodations that they can give and also state the same things in a general way by word of mouth. When questions as to their methods are put to them, however, evasive answers are given. This makes it impracticable to attempt to learn of the powers of a bank or of its legal limitations in doing business with the officers of the bank. The better plan is to go to one's attorney, or apply to the state banking department.

Such facts should be known to a contractor before he decides where to open his bank account, for he should open an account in a bank that will accept such security as he may have to offer. A man doing a limited business should not go to a very large and rich bank in a city. These banks carry on large transactions and a loan of a few thousand dollars or an account carrying from five to ten thousand is given scant consideration. A small bank, which may be just as safe in carrying on its business, would be pleased to have such an account, and the depositor would be much better off. If a contractor makes money rapidly, it is well to open an account in other banks and then, if it is advisable, a rich bank can be included in the list.

The first consideration is always to obtain a safe bank, one with a record of meeting its obligations and with a surplus set aside for emergencies. If the contractor has certain money transactions with other parties, it is sometimes necessary or a wise expedient to bank where these parties wish him to, as they may be able to obtain favors for him that he could not himself have secured. A contractor who does work in various sections of the country should select a home bank as his main depository and see that his relations there are kept favorable. This bank will then give him assistance as he needs it. If he does not do this, but opens new accounts for each job, he will find that his business will be so scattered that none of these banks will be willing to accommodate him.

With one bank as a home bank, an account for each job can be opened in a local bank and used as a secondary deposit, for drawing pay rolls and for meeting local bills. Money from the home bank can at times be transferred to the local banks. These

banks, however, will not care to continue the accounts unless some balance is given to them to carry, or unless the contractor does other business with them.

It is seldom good policy for a contractor who borrows money from banks to purchase stock in banks and go on the board of directors, for he may get himself into legal troubles by being a party to making loans to himself.

Some contractors, by retaining connections with a home bank and using it as a reference, have been very successful in obtaining credit in buying goods and securing assistance from country banks or those located in small towns. This is done by letters of introduction and reference and the depositing of some securities, much less than the business should demand. Small banks are not only looking for opportunities of making extra money, but also of increasing their gross annual business. When these banks discount notes and lend money on notes and other securities, they re-discount them with their larger city bank correspondents at a lower rate of interest, thus making a small profit on the capital furnished to them by the city banks.

A contractor with very limited means can often do well by banking with a private banker, from whom he can often borrow money without securities. Private bankers will allow accounts to be overdrawn when other banks will not. Though bankers will charge interest on the overdraft, contractors who need this accommodation will be glad to pay it. A depositor should not overdraw his account without advising his banker about it and making arrangements suitable to the banker, or he may find his checks protested, thus injuring his credit.

A contractor can sometimes obtain loans from a bank for 30, 60 or 90 days by drawing a draft on the owner of the job under contract and having the latter accept it, by writing over the face of it, and then by previous arrangements having a bank discount it. Thus the contractor only pays bankers interest on the loan, which the owner pays when it falls due, deducting the amount paid from the contractor's current estimate.

A general contractor can use this same method in advancing money to sub-contractors. The sub-contractor draws a draft on his general contractor, falling due on an estimate day, having the general contractor accept it and discounting it at a local bank. Thus the sub-contractor is able to run his work on a cash basis on the

credit of the general contractor, who uses the bank's money for this purpose without cost to himself. This is a much better method than having the general contractor use up his own cash in making the necessary advances to his sub-contractors. The author has used this method both as a sub-contractor and as a general contractor.

A general contractor can also raise money with a sub-contractor, by using notes between them, either notes of a third party or notes of one to the other. These, with the several indorsements, can generally be discounted through some bank or through a note broker. This can, however, become a dangerous practice and, if done for dishonest purposes, can bring trouble on all concerned.

It is an excellent idea for the contractor to keep in close touch with the leading official of his home bank, letting him know the important details of the business. Then when help is needed, all of these things need not be explained to the banker, who will be less likely to refuse the request. Bankers wish to know these things and trust people who repose confidence in them.

CHAPTER IV.

PREVENTING LAWSUITS AND LEGAL ASPECT OF CONTRACTS.

WHEN a contractor secures a new contract and begins work everything has a rosy appearance. Never having done work before for the owner or corporation, he finds everyone pleasant and polite, and the engineer or architect seemingly treats him with great consideration. It is this stage, when all concerned are friends, that may be the beginning of troubles which afterwards result in lawsuits.

A contractor should begin to fortify his position before he signs the contract for a job. He should read over carefully every section and clause of the contract and specifications before he signs any papers. If all is not plain to the contractor or if any doubt arises in his mind as to any part of the contract, he should not sign it until he has consulted his attorney.

Fortifying his position does not mean looking for trouble; the man looking for trouble will always find it. But it does mean doing everything in a businesslike manner, considering the future so that disagreements will not occur and legal entanglements will be prevented.

Attorneys' Services.

Contracts, specifications, proposals, bonds and similar documents are all legal papers, upon which the law prescribes certain limitations and proceedings with which the contractor must comply. As court decisions and new legislation likewise affect such procedure, it is not possible for a layman to decide for himself upon most points regarding these features.

For these reasons any contractor doing much business should always retain a competent lawyer. Those who have but a limited business should, as occasion demands it, obtain the services of an attorney. Most contracts should be shown to an attorney before being signed, not that he may recommend any changes in it,

although this may be done to the evident advantage of the contractor, but that he may explain any doubtful points to the contractor. The attorney should know from the start the conditions under which the contract was signed and should be generally familiar with the provisions of the document, so that if any trouble or dissensions occur he will be in a position to advise his client.

Though a man may never have a lawsuit, if he does much business without an attorney he is more than likely to have one. The sound advice of an experienced and able attorney has piloted many a business man through difficult undertakings and contracts that seemingly meant ruin. A contractor, especially one doing public work, is beset with legal entanglements. Are bonds issued by a town legally provided for? Is their sale legal? Is the work under contract properly authorized? These and a hundred other aspects of a public contract may have to be passed upon by an attorney. The fact that a town or city has an attorney means nothing to the contractor. In too many cases of bond issues by small towns and cities, the city attorney is himself inexperienced in such matters. As he is unwilling to acknowledge the need of a consulting lawyer experienced in these legal and financial dealings, believing he will lose his own job by it, he makes errors in such matters, which cause the contractor to suffer. This may be the case when contractors accept bonds, warrants or other evidences of indebtedness in payment. The legal aspects of the issuance of such bonds are both peculiar and technical.

Laws must be looked up in many cases and only an attorney can direct this. Without an attorney, a contractor on public work may work men more than 8 hours a day, thereby causing a breach of contract and preventing recovery for work done.

A lawyer is peculiarly fitted to advise a contractor, not only as to the legal aspects of contracting, but also as to his business and financial matters. He is accustomed to analyzing all matters presented to him and treating them in an impersonal manner. This the business man can seldom do, as he is too vitally concerned. Continual contact with his business is apt to make him overlook minor, but important, details. The attorney will catch up such details and will in most cases give invaluable advice. As proof of this, many of our leading financiers retain experienced attorneys to advise them, while nearly all of our large corporations

have a general counsel to advise the leading officials and board of directors.

Another matter for attorneys to oversee in these days is that the proper tax and income reports are made out annually to the state and national governments, especially if the contractor is doing business as a corporation. There are also cases where a man, through ignorance of the law, may commit a misdemeanor or crime that may start criminal proceedings against him. A lawyer's advice and knowledge can prevent this.

Lawyers cost money, for, as a class of professional men, they are well paid, but their advice at times may be worth many times the money paid them in fees. If trouble of any kind occurs, it is poor economy to wait until a lawsuit is the only recourse before engaging an attorney. Some years ago the author was engaged on some construction over which a number of disputes arose. The contractor, as soon as the first dispute occurred, engaged an able lawyer to advise him, and acting on the attorney's advice, so handled the work and conducted the relations with the owners that they were willing to arbitrate the various matters under dispute rather than stand a lawsuit which would have tied up their work and which they would eventually have lost. The arbitrator awarded to the contractor nearly everything he claimed and made the contract a very profitable one. This was due entirely to the able manner in which the attorney handled the contractor's business for him, preventing a lawsuit in which the contractor might have had thousands of dollars tied up for some years.

Recently the author was engaged as an expert in a lawsuit that showed to a marked degree the manner in which a competent attorney, skilled in law and possessing a general knowledge of construction work, handled the legal side of a contract so that in the end the contracting company won the important suit. To one who has had experience in these matters, the hand of the attorney was to be seen in every move that had been made.

The contract, a large one, was let on competitive bids, several contractors making proposals. The work was let at low prices. As soon as it was started, disputes occurred between the contractor and the company, due to drastic changes made in the plans. At once the attorney, who had approved the contract before it was signed, was brought into the case. He decided upon the letters that were written and upon every important thing that was done.

As the work progressed, it was found that no money could be made, due to some difficult local conditions and to changes made in the plans. Then the attorney instructed the contractor how to act, so that the owners refused to let the contractor proceed. Finally, the owners refused to pay the contractor. Acting on advice of the attorney, the contractor continued work with a small force, until the owners forcibly ejected the contractor and his men. Every step taken by the contractor was strictly according to law and protest was made in writing against every act of the owners and their engineers. The contractor immediately entered suit, claiming a breach of the contract and demanding prospective profits on the entire job before the changes were made. For nine years this case was in the state courts. Twice it went to the supreme court of the state and each time the courts decided that there was a breach of contract on the part of the owners, and awarded the contractor substantial profits on the job. These cases stand out as striking examples of what can be done for contractors by attorneys.

Expert Engineers as Consultants.

The services of expert engineers are also of great importance in preventing lawsuits. Today there are some engineer attorneys, men who have first had experience as engineers and have afterwards become attorneys. These men understand construction work; few attorneys are conversant with engineering or construction, the method of procedure, the recognized customs and the many technical terms. These must be explained to an attorney by an engineer; the expert can do this. Many contractors have been too busy to make a study of many of these matters and may know little of what is generally done when changes are made in his contract, plans or specifications. The engineer must enlighten the contractor in such matters.

Then, too, the engineer and the contractor can go over the work together and discover many things that even the attorney with his trained mind would miss. The engineer, like the attorney, should be familiar with the job during its duration and should be of material assistance in advising both the contractor and his attorney. The engineer will also make written reports of everything he discovers in connection with the work, and these the attorney will use, passing upon the legal aspect of each point made. This is of vast

assistance in preparing a case or in effecting a compromise. Frequently the expert engineer's work may mean many thousands of dollars saved for his employer. The author has known of suits which were settled by showing reports made by expert engineers on disputes between contractors and owners to the attorneys of the latter, making them recognize at once that the owner was in the wrong and would be foolish to stand suit.

Though an engineer can be brought in when a suit is to be tried, and will prove to be a considerable help as an adviser and an expert witness, to obtain the greatest value from his services, he should, like the attorney, be employed at an early stage so as to be cognizant of all events as they happen. For some jobs it is important that he should be able to see the work as it is being done and know the surrounding conditions at the time. This is especially true of foundation work. This alone may mean the difference of many thousands of dollars to a contractor. Most attorneys are glad to have such a consulting engineer or engineer counselor serving with them.

Later other engineers or contractors may be engaged as expert witnesses if a suit is brought. Many men of experience, if they are emphatic in their statements and composed on the witness stand, will make competent witnesses, but not all such experts are competent to advise a contractor and his attorney. Such an engineering adviser must have an analytical mind and know enough of legal procedure to understand what is evidence and what is not. He must be well versed in general engineering and in contracting knowledge. He must also have had experience as an expert witness, so that he may go upon the stand and present such testimony as may be necessary to the case. He must be able to withstand a severe cross examination by the opposing attorneys. The other expert witnesses can then substantiate the testimony of this engineer.

If a case is being tried, the engineering adviser sits with the attorney, making notes of engineering facts and points brought out in the suit and bringing them to the attention of the attorney at the proper time.

Keeping Diaries.

When a contract is once signed or the work is commenced, the contractor should keep a diary of each day's happenings on the job.

If a contractor has his own office on the job, one diary may be all that is needed; otherwise a diary should be kept at the contractor's office, and one at each office or camp on the work.

For this purpose, one or more men should be detailed to make entries in the diaries, as then the same incident or conversation is recorded from more than one viewpoint and the record will be more complete and valuable. This is especially true of a conversation, as the various witnesses will have written down immediately after hearing it, the important part of all that was said.

Progress reports and daily reports of work done should not be recorded in the diaries, as such records can always be obtained from the cost keeping and time reports. Each day a record of the weather should be made and, if concrete work is being done in the winter time, the temperature should be recorded at least four times a day; when the work is begun, when the temperature becomes such as to allow concreting to be done, when this work must be stopped on account of cold, and at the close of the work day. Any unusual storms should be set down and a full account of accidents should be put in the diary.

The coming and going of the contractor, the owner's engineer or architect and other officials should be recorded, as should the receipt of important communications and plans, and anything that may affect the time clause in the contract. Diaries in which such information is recorded will possess great value in the future, and will sometime prevent lawsuits. Few engineers keep such records. In case of a lawsuit, they will be of wonderful assistance to the contractor's attorney, while the lawyer on the other side, after the diaries are produced, will more than likely detest the mere mention of the word "diary," as he will find it hard to counteract their effect on the court and jury.

Some one should make entries in the diary every day. For use in the weather reports, a good thermometer, barometer and rain and snow gauge should be placed near the work. The reports gathered and recorded in this way can afterwards be verified by reports of the local station of the government weather bureau.

The diary is not kept for the benefit of the recorder, but for that of the contractor and his attorney. Every detail should be written so that the man unfamiliar with the job can understand it. For additional information regarding diaries the reader is referred to Chapter VIII of Volume I of this treatise.

The Care of Documentary Evidence.

Business today demands that everything be done with order and system. Letters, invoices, plans and all other documents must be preserved. To do this they must be filed. Inasmuch as many of these papers may have a direct bearing upon the contract, the contractor wishing to obtain his rights without going into court must preserve all documents that may affect his rights under the contract. For this reason a diary should be kept and care should be exercised in filing everything that pertains to the contract. Dates, as well as the documents themselves, are of importance.

It is a good idea for a contractor to have a safe deposit box large enough to keep his most important papers in, so that they cannot be lost or destroyed by fire. The signed copies of contracts can be cared for in this way, and duplicate copies can be obtained for office use. If supplement agreements are made after the contract is signed, these can be attached to the original contract; then all legal papers pertaining to the contract and modifying it are together.

An office safe is not as good a receptacle for papers as is a safe deposit box, but one will be found valuable for keeping many things and a contractor is wise in having one.

As soon as plans for any part of the work or written instructions are received, they should be marked "Received," with the date upon them. For this purpose a rubber stamp with red ink should be used, as it can be plainly seen on a blue print and over black ink. The same stamp can also be used on letters, as such a thing is needed if a contractor has several different jobs. He is a busy man and is kept traveling from place to place. Walking into one of his offices, he picks up a letter, sees the date upon which it was written, and then sees by the rubber stamp mark the date of receipt and below it another stamp giving the date of answering. Thus he knows at a glance whether or not his business is being given prompt attention, and without asking questions has the entire sequence of events presented to him. When a large volume of business is being done, it may even be advisable to have a time stamp showing the hour of the day when such things as the receipt and dispatch of letters and papers occurred.

If possible, the original plans and prints received should not be used on the work, but should be stamped, dated, and filed for

future reference. If plans are changed, the new copies should be stamped, dated and filed. In this way a complete record of the plans and the changes made in them can be had for quick reference. When many changes are made, and the contractor is delayed by the owner or his engineer or architect, such a record will prove invaluable. This alone may mean the prevention of a lawsuit.

It is sometimes necessary to make notations upon letters, showing to what plans or changes they refer and *vice versa*. Records should also be made in the diary when certain parts of the work are staked out by the engineer, for if delays are caused by this, the contractor must be able to show it. The author knew of one contractor who advised the owner of the receipt of all plans, changes of plans, dates of staking out work and all delays from these things. This man was very successful in obtaining time extensions and other advantages for himself, because the owner realized that the contractor could maintain his claims if forced to do so in court.

Co-Operation With Bondsmen.

In case the contractor furnishes a bond, it is good practice to notify the bonding company of many of these things. Should trouble then occur in connection with the bond, the bonding company is cognizant and can work with the contractor with a clear understanding.

The company furnishing the bond or the personal bondsmen, except for benefits derived from the contract, is really a party to it with the contractor. For this reason they should stand as one. The contractor should, as far as it is in his power to do so, protect the bonding company, and the latter should stand by and assist the contractor. If the bonding company is kept advised of wrongs placed upon the contractor and there is a likelihood that the contractor will be forced off of the work, it may be able to prevent this by notifying the owner of the injustice that is being done and stating what its position is in the matter. The owner has the bond furnished as a protection to himself, consequently he will act with caution if he finds that the bonding company is going to protect the contractor rather than the owner. All communications with the bonding company should be carried on through the contractor's bond broker.

A Contractor's Agent.

The contractor should always have on each job a competent man who can be given instructions by the owner, his engineer, his architect or his agent. There should also be a second man appointed for this, so that he can be present on the job in case of the absence of the regular man. The engineer or architect should be advised by letter at the commencement of the job as to who these men are and should be notified if changes are made. At the same time the engineer or architect should be requested in an agreeable manner to give verbal instructions only to these men and not to the foremen, sub-foremen and workmen. Many engineers give instructions to everyone in the contractor's employ and often cause trouble to themselves as well as to the contractors. Some engineers do not realize that most foremen and workmen in the employ of the contractor are not responsible and care little for the instructions of either the engineer or the contractor. Many of these men are not intelligent enough to receive and repeat verbal messages correctly, and the act of giving such men instructions often causes insubordination. The only proper method, in order to maintain an organization and discipline, is to give instructions through proper channels, as is done in an army or other large organization.

Such verbal instructions as are received should be written out in the diary and the names of any witnesses entered at the same time. If such instructions have reference to any changes in the specifications or plans, the contractor should have copies of the record in the diary made and have these copies attached to the specifications or plans or both. Verbal instructions are frequently forgotten by those who give them, so it is by such records that troubles regarding them are prevented.

Keep Your Own House in Order.

In starting any job, all of these things should be given attention. Once started in the proper manner, it is comparatively easy to carry them along without trouble, but if good feelings and friendly relations are depended upon to carry things through, the friendly relations are likely to cease and only trouble will result. If a contractor expects to get along smoothly with other people, he must keep his own house in order. In other words, there must not

be discord in his own organization. For this reason a set of rules covering the things to be done should be formulated and followed, and with this as a nucleus, a set of rules and regulations that will be found invaluable in carrying on a number of jobs at the same time can gradually be gathered together and printed.

It is rather an easy task for an able man, who is always present on his job, to look after the many details and to decide upon all questions as they arise, but let this same man have three or four different jobs in several states, and he is compelled to rely upon others. Few subordinates will attend to business as well as their employers. Therefore it becomes necessary to have rules and regulations for the guidance of the employees, not only that they may keep their records and do their work in a uniform manner, but also that they shall act in cases of emergency not in the manner that they may think best, but in a manner that is satisfactory to their employer. This should be based upon the experience of the contractor and that of his entire organization. It is only by such a method that a contractor can hope to prevent himself from being brought into trouble that may result in lawsuits. To give the rules to employees by word of mouth means that many of them will be forgotten just at the time they are needed the most, while if such rules are written or printed, it will always be convenient to refer to them.

Time Limits and Extensions.

On some jobs the time limit is an essential feature of the agreement and the progress of the work is watched very closely by the engineer or architect. The contractor should be just as alert and protect himself in every way possible. Weather conditions, holidays and everything else that might cause delays should be recorded. On river work, water gaging should always be done. Acts of God, such as storms and floods that delay and shut down work, seldom count in time limits, as working days must be days upon which ordinary work can be done, other than Sundays and holidays. Many contractors and engineers, however, have the erroneous idea that damage done and extra costs added to work by acts of God make it incumbent upon the owners to pay such extra expense. This is not true, as the law holds that no one is responsible for extraordinary weather conditions and severe storms. Inasmuch as the contractor,

according to his agreement, must deliver to the owner a completed structure, he must stand this extra expense. But he may be entitled to extra time due to these causes.

If the time limit is set at so many working days, the days of severe storms will not be considered working days, though allowances may not be made for the additional work made necessary by storms. If the time limit states an exact date for finishing the job or a definite number of months are given, then, unless a clause bears directly on this subject, additional time may not be allowed for delays caused by the acts of God. The author once had to do with the making of a contract in which it was possible to obtain extra time due to acts of God. As the contract was on a bonus and forfeit basis, this clause would have been a decided aid to the contractor if he had been delayed.

Another important matter regarding time limits is the receipt of plans and stakes for doing the work, and various instructions regarding carrying on the job. Records should be made of the receipts of these things and the time when permission and stakes are given for the work should be noted, for a time limit cannot be lived up to if the engineer is not ready for the work to be done.

In towns and cities, building permits must be obtained. Although in some cases the contractors obtain these, in others the owners must attend to this. The date of granting such permits and the date of delivering them to the contractor or notifying him that they have been obtained is of utmost importance. Lawsuits regarding delays have been decided by the courts on a record of the dates of granting these permits.

Changes in plans also affect the time limit. Minor changes of details should seldom make any difference to a contractor, but drastic and decided changes may cause an extra allowance of time, while there may be occasions when it would be possible to shorten the time limit. This, however, must be done by the mutual consent of the two parties.

If the contract time expires before the work has been completed, and there have been delays in receiving plans and stakes for the work, the contractor should, at the expiration of the time limit, write the owner or his agent a letter setting forth these various delays and state that he is willing to give up the work provided he is paid for all work done to date, for all materials furnished and not used, and that his retained per cent be paid over to him.

The chances are the owner will never answer the letter, so that his silence will give consent to indefinitely prolonging the time for completion. If he should allow the contractor to proceed and so give his consent in writing, the contractor is on even a better footing. Such a letter is bound to bring on a crisis in which under no circumstances can the contractor be injured, while the likelihood is that he will be much benefited. Such matters, however, must be handled with care, and it is the part of wisdom to consult an attorney.

Changes in Plans.

Reference has already been made in this chapter to changes in plans. This is one of the most troublesome matters that a contractor has to deal with, as the entire nature of a job can be changed by drastic changes in plans. The subject of changes has been discussed at some length in the Addenda of Volume I. It is necessary only to keep a record of these changes and of the extra cost, protesting by letter at once regarding the extra cost. If drastic changes are made, the matter should be taken up at once with an attorney and an expert engineer. With their aid an attempt should be made to get a new schedule of prices or payment for the extra costs from the owner. No matter what is done, the contractor must not act so that the owner can declare that there has been a breach of the contract.

Breaches of Contracts.

If lawsuits are to be prevented, the contractor must not cause a breach of the contract, for he will lose all chance of recovering under the contract if he does so. This subject has been discussed in Volume I, Chapter I, and also in Chapter II of this volume. In most cases the contractor does not want a breach to occur either upon his own part or upon that of the owner. If a breach is threatened, every move made should be at the advice of an attorney, for if a contract is lost the chance that the contractor will become bankrupt is great. A contractor cannot afford to take such a risk.

Conforming to the Law.

On public contracts, it is very necessary that a contractor should conform to all laws regarding his work, handling his men

and workmen's compensation for accidents, for if he does not do so his contract may be declared void. Only an attorney can keep a contractor posted as to such things.

Finally, the best way to prevent lawsuits is to be prepared to meet all emergencies. Then a contractor's position will be so strong that most people will be afraid to go to law with him.

Lawsuits are slow, tedious and very expensive, so they should be avoided. One prominent contractor who has operated all over the world is proud of his record that he has never brought a lawsuit against an owner.

CHAPTER V.

PLANNING CONSTRUCTION JOBS.

THE planning and laying out of a piece of work is always a difficult problem. To the experienced man it comes to be a more or less commonplace matter, but to the young man, just starting out in the difficult field of contracting, it is an extraordinary undertaking. He is almost sure to approach it either with fear and misgiving or with too much confidence. Though self-confidence is a good quality to possess in contracting, if you have not a large amount of knowledge and experience to back it up, it is likely to lead to loss of money or perhaps to complete failure. It is especially unwise to be too cock-sure of oneself in laying out and planning work. The initial work on a job is a matter of infinite detail. Every item of the work must be studied intelligently before it is possible to decide on the best methods of procedure. This can be done to some extent in visiting the job in order to submit a bid upon it. The estimating and bidding on jobs has been covered in Chapter I.

Visiting the Job.

Some jobs are advertised to be let at public bidding, while others obtain bidders only by invitation.

No matter how the invitation has come, the contractor or a competent assistant should always be ready to go. The job may be one of some magnitude, and may call for numerous outfits to be placed on it, or the work may be divided into sections and one or more sections let to a contractor. The job may be such as to extend over a large area or along a great stretch of country, a canal or railroad for instance, or it may be one confined to a limited area, for example, a wharf or concrete structure. Some corporations prefer to let the entire construction to one contractor, who completes it with his own forces or with the aid of other contractors.

When the call comes to bid, the first thing to do, before starting to visit the work, is to arrange to obtain prices on the various

materials that may be needed. If ample time is given—unfortunately for contractors it seldom is—letters can be written to various dealers and manufacturers for quotations. Answers can be made by letters to the home office. If the time is short, these quotations can be obtained by telegraph and the telegrams sent to the place of bidding as there may not be time to come home to make out the proposal. Always ask for a delivered price. This gives an exact price to go upon in making estimates of cost, and at the same time, if the quotations are later accepted by letter, makes a contract for the material needed that insures the contractor against paying higher prices afterwards. Get quotations from more than one dealer on each class of goods to be purchased, as only in this way is it possible to know that you are obtaining the lowest prices. For further information on this subject of prices see page 67, Volume I.

As soon as you arrive on the job ask for a schedule of quantities of work to be done and materials necessary. If it is found that unusually large quantities of any materials are to be used or special information is given as to the quality or character of the materials, communicate it at once to your dealers so as to obtain lower or more exact quotations.

The work of quotations attended to, the contractor's mind is now free to examine the work in detail. Do not do it from a car window, or from any rapidly moving vehicle. Take time to examine everything in detail. The best way is either walking or on horseback. See the entire job from one end to the other. If the contract is landed, this trip may be the means of saving many dollars in carrying on the work. It will also be of great assistance in starting the work promptly and conducting it throughout in an efficient manner.

The time spent in learning every detail of the work and all the local conditions will not only allow of planning and carrying on the work in the best possible manner, but it will also give the data upon which to make a more intelligent proposal. Too many contractors go over a job hurriedly and indifferently, knowing hardly enough to make a proposal upon it except by guessing and knowing nothing regarding how the work must be done. If the job is landed, several more costly trips are made to get acquainted with the work and the country, adding an unnecessary expense.

Careful notes should be taken on the work and recorded. First of all the different classes of excavation should be noted with their

location. This not only affects the methods of doing the work, but likewise the making of embankments and the distribution of the wasted and borrowed material. The work should be divided into sections, not necessarily as the engineer has done it, but according to the character of the work and the kind of plant needed to do the various sections. For each one a camp site should be selected, one that is convenient to the work and also situated so that supplies can be hauled to it. For more information on camps see Chapter VII, Volume I.

The hauling of supplies is very important. Notes should be made of all receiving stations, both on railroads and water routes, the distances from various parts of the line, and the roads over which materials and supplies must be hauled. The condition and grades of the roads must be noted. A few steep hills may double the cost of hauling, as the steepest hill will govern the size of load to be carried. Routes should likewise be selected for bringing heavy machinery to the different parts of the work, and estimates made of the probable cost, as in beginning the job this is an important factor in keeping down the cost and also in putting the job on a paying basis.

Quarries of suitable stone, sand pits, and supplies of timber and piles must be located, and information obtained as to the cost of developing and furnishing these things. When tunnels are to be driven, special attention must be given to these details, and also to the location of a power plant.

The quantities of excavation, of concrete and all other classes of work should be tabulated, with the distribution of the excavated materials and their classification, so that a plan can be mapped out for the entire job.

Sub-letting Work.

All such data will be valuable not only if the construction is to be done entirely with the contractors' own forces, but also if all or a part of it is to be sublet. Frequently subletting is attended with much worry and trouble, due to the fact that the work is not divided up into the proper sections and that the character of the work is not suited to the outfit of the subcontractor. See to these things and few subcontractors will fail; instead they will make money for themselves and for the general contractor.

As the merits and advantages of sub-contracting have been dis-

cussed in Volume I, Chapter I, little need be said regarding subletting work, as different features of this subject will be treated under the heading of planning a railroad job. Many classes of work admit of using sub-contractors, and in some lines, special classes of work are nearly always sublet.

Planning the Work.

The contract once landed and signed, the contractor is ready to begin work. He can now be likened to a general starting a campaign. He must assemble his forces and plan the method of his attack. With the information gathered in making the proposal, he should now be prepared to go ahead. First of all a competent man must be placed in charge of the job. If all or any part of the work is to be sublet, he should be the one to do it. With the data gathered, this subletting can be done to advantage, and the subcontractor will be able to get to work quicker for he will know the quantity of work he will have to do, the kind and amount of outfit he needs, the location of his camp and all other important details.

The most vital thing in preparing for any job is obtaining the plant needed for it. With the data gathered, as described, before the contract was awarded, the outfit needed can be decided upon. Any tools or machines that have to be purchased can be arranged for at once by obtaining prices from the various manufacturers in that line, and asking for dates of delivery. This last is often overlooked, causing costly delays. With this information in hand orders can be placed for new machinery as soon as the contract is awarded. Dates of delivery can be fixed so that the machinery will arrive on time and not ahead of time, causing unnecessary expense of re-handling and using up money for labor that could be put to other purposes.

There are two ways in vogue of starting jobs. One, followed by many contractors, is to spend large sums of money and much time on preparing to do the work. They do not start any work until all tools and machinery have been assembled, and they are "organized," as they term it, to do the job.

The other method is to get men and teams with small tools to work at once, earning some estimates from the start, and thus develop the work for the larger installation of machines and allow

the work of preparation to be carried on at the same time. By this method the work is developed so that some income is derived from the start. The machines, as they are installed, do their maximum work and the heavy expense of starting the job is extended over some weeks.

The first method can hardly be approved. It is all right in theory, but does not work out in practice. On a large job, where many different kinds of machines have to be installed, the cost can run into many thousands of dollars, and although the machines themselves may not have to be paid for at once, part payment is generally demanded. The great item of cost, however, is labor and this means a large expenditure of ready cash. In this way the expenses are running up and not a cent of income is earned. This money must earn for itself some interest and by this method it is slow in doing it. Thus, before the job is fairly started, it is in debt. In many cases this means that the contractor is hard pushed throughout the life of the job, and does not derive any profit from the work until it is completed. Meanwhile he has lost many thousands of dollars in interest that would otherwise have been his.

This has been demonstrated by the way a number of contractors have handled their work on the Catskill aqueduct, now being built by the city of New York, and on the New York state barge canal. Some have followed this plan and, after six or eight months, they have been compelled either to go into the hands of a receiver or to make some kind of a working agreement with their creditors, both of which are costly. In nearly every case of which the author knows, this could have been prevented by better management.

For these reasons consideration will be given only to the method of developing the work while the preparation is going on.

Some years ago the author was bidding on a job upon which a fourteen months' time limit was asked. He suggested that the job be made a bonus and forfeit one, with a nine months' limit. This suggestion was adopted by the company and the contract awarded. The author at once drew up a layout and plan of doing the work, including a schedule of time for each class of work and the different parts of the job. This included every detail: the camp, the plant, the purchasing and placing of all materials and

the forces necessary to be employed from time to time. The schedule called for the work being done in seven and a half months, thus giving a leeway of six weeks' time. The author expected that certain quantities of work would be increased and arrangements were made for such increases in the schedule. The anticipated increases occurred. Plans of various structures to be employed were drawn and placed in the hand of foremen to be used. The financial arrangements of the whole job were gone over and arranged for, the work being arranged in the schedule to earn the money as needed. After the work had been started some six or eight weeks the author was called away to start another job, yet the contract was finished a week ahead of time and six days' bonus earned. In addition, the anticipated profit figured was made. Many contractors who knew of this job, and most of those who bid on it, said the work could not be done in nine months and that money would certainly be lost by a young man handling it on book knowledge.

Plant Layout.

It is necessary not only to make a list of the plant needed but also to make up a plan showing how it should be located. This plan is of vital importance, for the cost of the work can be greatly increased by a poor layout. In some cases this layout can be made on the ground by means of a tape line, but the best results can generally be obtained by surveying the ground and from this making a drawing upon which the layout is planned. This is the method of planning any engineering structure. It saves money, and gives a structure better suited to the needs for which it is designed.

Thus a derrick that is to cover a certain area of ground and serve several machines may be located in the field, but greater service is likely to be obtained by a careful study on paper.

Many of the leading contractors of the country now employ expert mechanical engineers to pass upon the efficiency of their machines from a mechanical standpoint, but entirely ignore the economical side of placing their machines so that the service for them is reduced to the minimum and their outputs are kept to their rated capacities. An advisory expert in this line would more than save the money paid him.

Fig. 4 shows the plan and layout for a job for building a sewage pumping station and a sewer. Over the sewer a cableway was used. A 60-foot boom derrick was set up for the building, the foundation of which was of concrete. The sewer was also built of concrete. The derrick handled the concrete from the mixer to the forms in the building and also to the cableway which placed the concrete in the sewer. The layout as shown was made in the field, but if it had been first made on paper to scale and laid out on the ground afterwards, some improvements would have been made. First, the stone pile, instead of the sand, would have been placed next to the mixer. This would cut down the wheelbarrow work in serving the mixer, as twice as much stone was used as sand. As the bricks were served by the derrick, they could have been placed on the other side of the street and the mixer moved nearer to the derrick. This would have allowed the derrick to be set up closer to the sewer, the derrick being so set that it would serve the back corner of the building. This would have made it possible for the derrick to serve concrete to a considerable length of the sewer, saving rehandling of the buckets with the cableway. The cement house, too, would have been located closer to the mixer or at least within range of the derrick. These few suggestions show how an office layout can be made better than one devised in the field.

For more information on this subject the reader is referred to pages 76-78 of Volume I.

Time and Progress Schedules.

The amount of plant needed will depend upon the time limit of the job and the weekly or monthly progress to be made. A time chart should be made up in connection with the plant. Two examples will be given as illustration. For a concrete structure, such as a wall or bridge, a blue print can be used, and the yardage worked upon the various parts of the structure. For a bridge, first the number of yards in the foundation can be marked, then the yardage in the abutments or piers, the arch, the spandrel walls and lastly in the coping, finishing and ornamental work. On this print can be marked the daily average output of the mixer (including days worked and those upon which the mixer is idle), and thus the number of days for placing each part of the structure can be

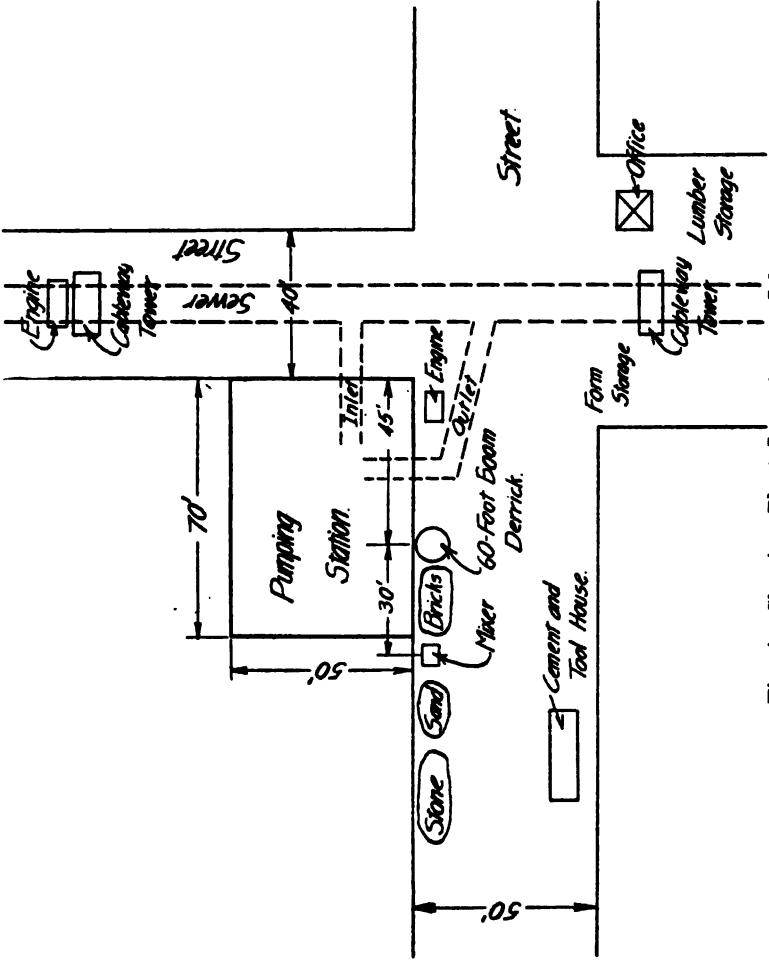


Fig. 4. Showing Plant Layout on a Job.

figured out and marked down. If it is desired to show the work that should be done each month, an outline of the yardage can be made on the print and within this outline the yardage marked, with the number of machines and men needed to complete the yardage within the given time.

Another way is to mark down the yardage in a book, with the machines and forces and time shown within brackets opposite the yardage. The author's method is to do this work on a blue print for an office record and then copy it into a book for field use.

The same general method can be followed for excavation work. The details of yardage can be marked on a print together with the men and machines needed. Either a small or a large job can be covered in this manner, whether done by hand, with scrapers, steam shovels or other machines. Trench work is very easily shown in this manner. For excavation the classifications of the material should be shown, as well as the quantity.

After the time chart is made up it is necessary to prepare a print to show the actual progress made so as to see if the work is being done with satisfactory progress. This print can be a duplicate of the other with only the yardage on it and each week or month the progress can be marked on it, either in one color or in different colors to show how the amount of work has varied in the different periods. For additional information on this subject Chapter IV of Volume I should be consulted.

Financial Arrangements.

In starting a job one of the first considerations is to decide upon the financial arrangements. This should be based upon the amount of capital in hand, and the estimates that can be earned on the job each month. First, the money needed for payrolls must be considered, and other cash expenditures as freights, team hire and the small incidentals that are difficult to anticipate, but which can be estimated from accounts kept on other jobs. These include traveling expenses and other items. Of course, there are many purposes for which cash is not absolutely needed, as credit can be obtained, but if all bills are discounted the money so earned on a fair-sized job is in itself a nice profit.

The money arrangements must go hand in hand with the other

plans for the work, otherwise the contractor will find that he will have much trouble. The details of financing construction jobs have been covered in Chapter III.

How to Start a Railroad Job.

Railroad construction embraces many different classes of work, such as earth and rock excavation, masonry work of all kinds, foundation work, timber and steel construction, landscape gardening, track laying and ballasting and the building of telegraph lines, fences and structures of many kinds. There is hardly any other class of construction that embraces so much or broadens a man as much as building railroads. A contractor who has had experience in railroad construction and is proficient in it, is competent to undertake almost any class of work and carry it on in a satisfactory manner. His exacting and broad experience fits and trains him to solve almost any problem.

Without infringing upon the technical and theoretical side of the subject of railroad building, a treatise could be written on the practical side of this important work that would be an aid to both engineers and contractors. Both have many things to solve in common.

To some extent the suggestions that follow are applicable to other classes of construction, especially wagon roads, aqueducts, canal building, and all work that has a long center line and a narrow right of way; in other words, construction stretching over a number of miles of territory.

The planning and layout of a certain piece of railroad work will serve as an example of good thinking along these lines. The job in question involved the construction of thirteen miles of new line, an extension of a coal road into the mountains. There was some very heavy rock work, necessitating the construction of five tunnels. There was one steel bridge and a number of timber bridges requiring four or five million feet of lumber. The work cost, on an average, more than \$50,000 a mile, and a year was allowed for its completion.

For the greater part of its length, the line followed the course of a small stream through the mountains. Four of the tunnels, located near one end of the line, had to be bored through solid rock, while the fifth, situated near the other end of the line, was about

700 feet long, and was built through soft earth. The steel bridge was near the end of the existing line, but the timber bridges were scattered along the line and there was no way of hauling the timber necessary for their construction to them by wagons.

There were three bases of supplies—the terminus of the line already built, another railroad about five miles from the center of the work, from which fairly good loads could be hauled to several sections of the new line, and the branch line of a competing road, that extended to within half a mile of the soft tunnel. Any part of the work was within five or six miles from one of these points.

The first thing the contractor did after the contract was given to him was to accept by letter the lowest quotations on all materials on which he had obtained prices before bidding. That done, he got together his data and put his mind to planning an effective layout.

Before the contractor had submitted his bid his engineer had gone over the line and had made notes concerning every detail. He had selected camp sites, possible quarries, and sand supplies. He had listed all the quantities of the various kinds of work to be done, in several schedules, which showed waste and borrow of earth and rock, possible classification of material, disposition of all excavation, the materials to be bought, and the haul necessary to bring them to the scene of the work. From this data, together with the map and profile of the work, and with other information furnished by the engineer, it was possible to plan and lay out the job. The time schedule was the first thing to be attended to.

In making up a time schedule it is necessary to estimate the plant and forces needed, and to do this, on such work as railroad construction, the work must be divided off into sections. If the work is to be done by the contractor's forces, a different plan of division is likely to be adopted from the one used if the work is to be sub-let. If the work is to be sub-let, it should be divided off so that material from one section will not be hauled onto another. Similar classes of work should be grouped together, since a man with a scraper outfit is not likely to want to take out a rock cut. Steam shovel work should be let in separate sections and a long tunnel can often be called a single section and sub-let to advantage. If possible, there should be on each section one attractive piece of work upon which forces can be employed in bad weather.

If the contractor's own forces are employed throughout, the work should be divided with reference to the position of the construction camps where plant and men are located.

The particular railroad job in question was divided into sections for sub-letting. These sections were submitted to the engineer for the railroad company and received his approval. For each section, excepting the first, plant and force of men sufficient to finish the work in eight months was estimated. The first section was to be completed in from five to six months, since the steel bridge was on it and it was necessary to get track down so as to place the steel for the bridge. The camp on this section was also needed for the forces that were to erect the timber bridges, which were all located on the first five or six miles of the line. All the timber was to be brought by train to a yard on the first section, and there framed and carried by a construction train to the various bridges, for circumstances rendered it impossible to do the framing on the sites.

All of this work was included in the time schedule, as well as the masonry work, for the bridge abutments and the small piers for the timber bridges had to be built in advance. The culvert work was also listed. The number of men and the length of time necessary for the excavation of the important cuts and tunnels were carefully noted. The number of yards to be moved each month on each section was set down. With such a schedule it was very easy to see if the work was lagging, and steps could be taken to hasten it.

Too much importance cannot be given to the time schedule. Not only does it set forth the plant and forces needed on the work, and the rate of progress necessary to complete the job on time, but also provides a basis for the more intelligent planning of financial arrangements.

On the construction of this coal road the next step taken after the completion of the schedule was the making of the financial arrangements. It was very easy to ascertain the amount of money needed to start the work when the number of men to be employed and the length of time the work would take were known. The first month's progress was bound to be slow, but with the probable amount that would be earned each month, and the probable cost of carrying on each month's work estimated from the schedule, it was not difficult to see during what months the work ought to carry

itself, and when assistance would have to be given on the various sections.

It is necessary to make an estimate of monthly cost and profit, not only when the contractor's own forces are to be employed, but also when a sub-contractor is doing the work. The mere getting of a contract does not build anything. Eternal vigilance is always the price of success in making money. A sub-contractor needs looking after, and always needs the support and assistance of the general contractor. If he needs financial aid the general contractor should help him arrange for it, since the failure on the part of the sub-contractor to finish his part of the work may mean a loss of money on the whole job. Thus the interests of the sub-contractor become those of the general contractor.

After the financial arrangements have been completed it is time to start work on the job. In sub-letting work the form of contract used should always be equitable, but it should, at the same time, protect the general contractor. He is responsible for all the work. He furnishes the bond and altogether has much more to lose than the sub-contractor. On the other hand, the sub-contractor may have little if any money; he may have a poor outfit, and be badly equipped for work, yet with the assistance of the general contractor he may finish the work in a first-class manner, and on time, making money for himself and the general contractor. If the sub-contractor is an honest man, meaning to do good work, he will not object to signing a contract that will allow his employer to be the judge of the progress being made, of the outfit and forces necessary for the work, and of a few other like details. It is poor policy to demand a bond of sub-contractors, for if trouble occurs with them a bond only complicates matters.

On this railroad the entire grading work was let to twelve sub-contractors, the sections ranging from half a mile to a mile and a half in length. Some little of this work was earth and could be done with scrapers, but most of it was rock. Some of the cuts were from 50 to 75 feet in depth, but none were very long. No more than one tunnel was put upon any single section, although in one instance a rock tunnel about 500 feet long was separated from another 200-foot tunnel only by a small embankment. Under ordinary circumstances it would have seemed advisable to let both of these tunnels together, but the man who took the section with the small tunnel on it insisted on having a tun-

nel, and it was given to him, although at the outset it was thought that he would not do the work with dispatch. It turned out that although he did the rest of his work well he neglected the tunnel, so that within a few months it was taken away from him and included in the other section.

The soft tunnel, with a few adjoining small earth cuts, was made into one section, and the entire work of excavating, timbering and lining was done as one contract. The railroad station close by served as a convenient point at which to receive the necessary materials for the tunnel. This was a slow job, but since it was within a mile of the far end of the line it did not retard any of the other work. Some coal mines located close by made it difficult to keep laborers at this point.

The masonry and pipe culverts were included in the contracts for the grading work. As a general thing either this method may be followed or the culverts and grading may be let separately. In the author's opinion the better plan is to include the culverts in the grading contract; for when let separately, the grading contractor may be delayed, waiting for the culverts to be built. If they are included in his contract he has the control of the situation and if he does not wish to construct them himself he can sub-let them.

In sub-letting the work on the railroad in question the outfit each contractor was to have was listed in his contract. This, together with frequent inspection of the work and weekly reports of the forces engaged, assured the general contractor that the time schedule was being carried out.

While the work was being let the warehouses were being built to receive the supplies and materials for the work. One was near the soft tunnel, one near the center of the work and the third at the other end of the line. From these warehouses the sub-contractors received their supplies. At a point near the center of the work the office of the general contractor was established.

Bills for the pipe needed in the culverts were secured at once, and the pipe was ordered, giving points of delivery and dates for shipping. It was arranged so that the material should come in plenty of time and in such quantities that the cars could be released promptly. This saved demurrage and also made it easier to meet the payments, as much of this pipe could be placed by forces organized for the purpose, so that the payment for it was received

from the railroad company before the manufacturer's bills fell due. Such details are always important, and mean much in arranging the finances of a job.

The cement needed for the work was estimated and contracted for, quotations having been previously secured on a rough estimate. A contract was also entered into for the explosives needed.

The masonry work for the bridges was let separately from the grading to contractors who made a specialty of that class of construction. They immediately began to get out stone and started the excavation for the foundations. The timber bridges and track laying were to be done by the general contractor's own forces.

In letting all of this work the general contractor set the prices. There are several methods of arranging prices in sub-letting. One is to have the sub-contractors submit bids on the work, in the same manner as for a general contract. This method is hardly to be commended for several reasons. The sub-contractor may bid higher prices than are being paid for the work, which would result in a waste of time for both parties concerned. The prices bid may not allow a reasonable margin of profit for the general contractor, especially if the sub-contractor should for any reason fail to carry out his contract. Again, the prices bid may be so low as to give the general contractor an excessive profit, and in all probability cause a loss to the sub-contractor. These are all good reasons against sub-letting work in this manner. and there are no equally good reasons in favor of it.

Some contractors sub-let work by making known their own contract prices, and reserving 10 per cent on those prices for themselves. Unless the original contract is shown, this method nearly always causes trouble, for the sub-contractor will later hear rumors concerning the prices the general contractor is getting and will at once conclude that the general contractor is acting in bad faith with him. Accordingly a hard feeling springs up, and the two, whose interests should be identical, work against one another. This method of letting is, moreover, not always equitable. It sets uniform prices for each section, when some sections, if divided off properly, can be done for much less than others. In consequence, one contractor will have a handsome margin of profit and another little, if any, profit. This fact may prevent sub-contractors from

taking certain sections, and the owner may be forced to do them at a loss, with his own forces under hired superintendents.

The best method of sub-letting is for the contractor to name his prices. The almost universal custom seems to be for the sub-contractor to allow the original contractor to have a gross ten per cent. On this basis prices can be named as an average and in sub-letting the two parties can vary a little to suit conditions. In this way the sub-contractor can refuse the work, if he wishes, without having gone to any great expense, or he can "dicker" until he gets a price that will suit him. It is not any concern of his what prices the general contractor is getting. On exceptionally fine sections the prices can be less than the average price, thus giving a margin to be added to difficult and expensive sections.

This method gives the sub-contractors a fair deal and also allows the general contractor to make an average profit of ten per cent on the entire job. It is necessary to remember that if the contractor did the job with his own forces his profit would vary exceedingly on the different cuts as well as on the different sections. The sub-contractor must make all his profit on one section. There are occasions when it will even be necessary to pay the sub-contractor the same prices as those received by the general contractor. In such cases the sub-contractor should be known to be a man who will stand by his agreements. The author has had extended experience both in letting sub-contracts and also as a sub-contractor, so he speaks with an intimate knowledge of both sides of the question.

As soon as possible after the job is started a contract should be made with a steel manufacturing concern for any steel bridges that may be required. Contracts can be let separately for the fabrication of the steel and the erecting of the bridges, but, as a rule, the most advantageous contract for a general contractor to enter into will be one which provides for the doing of both classes of work by the same company. A provision should be made that the steel company shall furnish its own false work if any is needed. In drawing up this contract, care should be taken to provide for the delivery and storage of steel; otherwise the contractor may find his small profit on the steel work eaten up by having to receive and store the steel and to rehandle it to the site of the bridge. Many contractors have suffered by signing contracts of this nature hurriedly.

Bills for timber for the wooden bridges should be obtained from the engineer as soon as possible and arranged for use. Many contractors simply copy these bills, making copies for the framing and erecting and others for the saw mill men. This is an expensive way to do. As a rule the engineer makes the bills for the bridges up by bents, although at times the various sizes are lumped together. The contractor should arrange the bills for erecting and framing by bents so that no mistake can be made in the field. The original copies from the engineer should not be changed in any manner and should be filed for reference. The prices for sawing all the different sizes of timber for each structure and also for the entire job should not be lumped together. Prices for the various sizes can be obtained from different saw mills and dealers. Many of the quotations made will vary a great deal. All of the prices received can be tabulated. Then by a little labor and the use of arithmetic, bills for sawing can be made up, whereby each mill or dealer can be given sticks to furnish at the lowest prices, and yet each order will carry large and small timbers, so that a run of logs can be used to advantage. The contractor who buys several million feet of lumber in this manner can save himself much money and be compensated for the extra labor he spends upon the matter. With the orders numbered it is very easy to keep a record of the structure in which each carload of timber is to be placed. On the job we are discussing, all of these things were planned for, and the various details were recorded in a book for quick reference. Copies of such information as the sub-contractors and superintendents would be likely to need were made and sent to them with instructions and letters of transmission.

After the grading was started the track laying was arranged for. The receipts and storage of ties, rails, plates, bolts and spikes were attended to promptly, so that when the time for tracklaying came there was no delay, and the building of the bridges was not held back.

Planning work is all well enough, but it will prove useless if someone does not see that the plans are followed. A competent man should make frequent trips over the line to see how things are going. Daily, weekly and monthly reports should be required and progress charts and profiles should be made. Then, as the work progresses, the time schedule and progress charts should be referred to and any errors or omissions can be corrected at once.

Each month's financial arrangements can be looked after several weeks ahead, since a money shortage on a construction job is a serious thing to face unexpectedly.

To start actual work on either the general contractor's or a sub-contractor's job, the first tools needed are axes, a grindstone, cross cut saws, cant hooks, log chains and such tools as are needed for clearing the right of way. Men can be set to work on this at once. Native axmen can often be employed to advantage, while laborers are being brought to the job. A few hired teams can be employed to haul lumber. At once some kind of a shelter can be built for horses and mules—a large canvas will serve the purpose or boards and poles can be used and the structure improved after it is put into use. The stock for the work can be shipped to arrive as soon as this shelter is made. This will stop hiring teams and allow horses to be used in moving logs.

Meantime a cook shanty can be built and the feeding of men started at once. A large building for sleeping can also be erected. These can be arranged for within a day or two.

As soon as a few hundred feet of right of way is cleared men can be put to work on the road, opening up grade points in rock cuts or where steam shovels are to work. For a few days wheelbarrows can be used, then vehicles can be put to work. For scraper or grader cuts a gang of men can be put to work taking out stumps. For this a stump puller should be used and explosives should be ordered at such time as to have had them on hand to assist in this. A cut cleared of stumps within a day or two will allow scrapers and graders to start work.

If there is any side hill rock work, where a cross section of the roadbed is partly in cut and fill, a large gang of men can be placed on this at once, and by blasting with judgment a large estimate can be earned quickly to help carry on the work.

While this work is going on, the camp is being built and used. An office and commissary with a storehouse and a good blacksmith shop is needed promptly. This, too, at first can be a makeshift building to be improved as the work progresses. If these buildings are constructed according to a well-thought-out plan, they can be used before completion, can be built at a minimum cost and will serve their purpose much better than when the carpenter or foreman is allowed to build as he pleases.

Likewise buildings for men can be built as the work is being

developed. Men for a while will put up with inconveniences, but they will soon begin to grumble if the camp is not put in shape for them promptly. Doing this under their inspection will often please them much more than if everything has been completed before they arrive.

If one or more tunnels are on the line, the portal cuts should be started early and the power house site selected and cleared up. Then the building can be raised, one side being left open to take in the machinery when it arrives. If there is not an approach cut, then the tunnel heading can be started with ordinary drills, so that the columns and machine drills can be set up as soon as they reach the job.

For steam shovel work the ends of the cuts can be graded by teams; the track can be laid and temporary trestles built, so that as soon as the shovels arrive they can be put in position and worked day and night if necessary. A steam shovel put to work in a cut that has not been properly developed is worked at a disadvantage for some days and possibly weeks. Meantime, the operating expenses are as great as though the maximum output is obtained.

Do not do any work without stakes. Payments for work are often short or confused by it. Then in many cases mistakes will be made that will be expensive to correct. Ask for stakes and have them before starting.

A job started in this manner will earn some estimate during the first month, and during the second a large and profitable amount of work can be done. It will be on a paying basis much sooner than by the first method previously mentioned and will be finished earlier, as the author's experience is that even when everything is prepared before starting the work, there remain many details to be attended to and the job has still to be developed.

Starting a Street Paving Contract.

Many contractors make their start at contracting on either concrete work or street and road construction. On street work the chances for loss are great, so that it is only by careful planning that jobs can be handled to show a profit. This is due to obstructions found in the bed of the street and the traffic over the work that must often be cared for during construction. For this reason

the author will map out how he would start a job of paving a street with bricks or blocks on a concrete base, and putting in a concrete curb in place of an old one.

Upon being awarded the contract, the contractor should first make out a list of all the work to be done, with the quantities of material, such as brick, crushed stone, sand, cement, steel, filler, forms, etc., and the amount needed in each square or block on the street, also of the plant needed. With this information, prices and deliveries on everything could be obtained and a time schedule made up for the work, showing where the work was to be started, the forces to be employed from start to finish, the teams needed and the length of haul for each block, the time to start and finish each section, the amount of work to be done each week, from which the estimate to be earned could be figured, the probable payroll and expense account estimated and every other detail.

As this was being done—it should all be done within a week—the outfit could be placed on the job and the first materials delivered. Within ten days the forces could be placed on the work and the job commenced. With all this information the financial arrangements for the entire job could be arranged by the time work was begun or shortly after.

By such a schedule, made out in detail, almost any clerk, timekeeper or foreman could see to it that the material was placed on the job so there would not be a shortage in any section, nor more than was needed, so that rehandling would not be necessary. Wasting materials and rehandling them eat up much profit on many jobs. A contract cannot be handled economically unless the man in charge is familiar with every detail of the quantities, both of work to be done and materials to be furnished. It is well to have these in one's memory, but memory should not be relied upon; they should be set down for easy reference.

If the street can be closed for traffic the job is easier to handle, but in many cases only one side of the street can be closed up. Then begin by tearing out the curb on one side, and as soon as a stretch of a hundred feet or more is torn out and the excavation made, begin to place the new curb.

Two kinds of concrete plants can be installed: a central plant, where all the mixing is done and the concrete hauled from the mixer to the place of deposit, or a street mixer that is moved along either by its own power or by power applied to it, the mixer de-

positing the concrete directly in place. Wheelbarrows or buggies are sometimes used to carry the concrete from the mixers, but machines can be installed that deposit the concrete in place. When the materials can be unloaded from freight cars into bins and the mixer placed there, then a central mixer plant is to be preferred, but when the raw materials have to be hauled the preference is for a street mixer.

With the curb forms ready, the concrete can be placed at once, and the old pavement can be ripped up opposite the new curb. This should be followed by the grading gang, and, as their work is finished, the mixer and concrete men can be brought back to lay the concrete base. When this has set, paving can be started. This can all be done according to a schedule.

When the paving is once started the various forces should be so arranged that the tearing out and placing of the curb is kept ahead of the tearing up and grading of the old pavement. This work should be kept ahead of laying the concrete base, and the paving work should go on continuously, with the cleaning up being done behind the pavers.

The pavers are the highest salaried men, so that their work should not be interrupted, as delays for them quickly mean loss of money. If the proper number of men is put on each class of work they will become accustomed to it quickly and soon do it with dispatch and economy.

The forces should be kept as close together as possible and yet should not be in one another's way. Work stretched over a large area is difficult to handle, materials and tools become lost, and the cost of doing the work is increased. Try to work along continuously, so that the outfit and forces will not have to be moved often. For that reason, if a street or a part of it can be closed to traffic, the whole width can be done at one time. In one block the curb work and the tearing up and grading can be done, the concrete base and paving can be laid in the block behind it, while the finishing and cleaning up is being done in a third block.

If only half the street can be worked upon at one time, keep on one side until it is finished, then work back on the other side. Finish cross streets as the other work is done. See that proper provision is made for water in the gutters, as nothing affects paving work as much as water.

If other parties have to fix pipes, sewers, conduits and similar

things ahead of your work, make it your business to see that it is done promptly or else you will be delayed and your entire job upset. It may be unpleasant to make other people "toe the mark" but the contractor is the one who will have to pay the cost of delay, and if a contractor gets a reputation in a community for refusing to stand for trifling and such delays, he will find that the other parties will do their work more promptly and he will be respected. An easy-going man will find that other people will do as they please with him, and he will pay the bills.

These are essential points to consider in planning work. If this is done from the start the contractor will boss the job, if not the job is more likely to boss him.

The variation from this for other classes of pavements is slight. For sheet asphalt pavements, if a mixing and heating plant is not already owned by the contractor, or if the binder and surface materials cannot be purchased from a plant all ready for use, the contractor should make arrangements as soon as he gets the job, either to hire or to purchase a plant. There are now on the market several kinds and sizes of portable asphalt heaters and mixers so that one can be obtained to suit the job in hand. If the contract is a very large one or the contractor contemplates making a specialty of this class of work and he has capital enough it will pay him to build a stationary plant of fair daily capacity.

The placing of the binder and finishing courses will follow that of building the concrete base. An asphalt roller must also be provided for the work.

The planning for a Belgian block pavement, wooden block, asphalt block and other block pavements will be similar to the brick pavement already described.

The work for a concrete pavement is much like the concrete base for other pavements, except that the surface is finished off for a single course pavement, while for a double course only the top is finished. Then in planning the work arrangements must be made for curing the pavement according to the specifications.

Wagon Road Construction.

In starting a wagon road contract the first thing that should be done is to make up a time schedule; this subject has been dealt with at some length, so it need only be mentioned here, but this

schedule should include the arrangements for plant as well as for the work itself. After this schedule is arranged the financial matters are mapped out and provision made for the necessary money. Then the work can commence.

As the schedule is being made and money arrangements fixed, some of the men and outfit or plant should be sent to the work, so that time will not be lost in making a start. The exact procedure will depend more or less upon the form of contract and method of payment. If unit prices are paid for each class of work then the job can be started in one manner, while if a price is paid only for a finished square yard of surface or a running foot or yard of the road, other methods must be used. Another question to be decided in starting the job is whether such materials as stone and sand will be purchased or quarried on or near the work.

The author believes firmly in the principle that a job should be placed on a paying basis as soon as possible, and that some money should be earned from the start, while the preparatory work is going on, instead of doing all of the preparatory work before actual construction is started. Keeping this in mind it is obvious that if a job is taken with unit prices, then as soon as the work of excavation is started money is being earned, and the job, with other work starting up, can soon be placed on a paying basis. If payment is made only on the completed surface, then the work must be handled differently and the road must be built up in short sections, in order to complete some and receive early payments. Then, too, if materials are bought they can be delivered on the job at short notice, while if they must be produced, this part of the work may have to be started ahead of the grading, especially if payment is made only for the completed surface.

If the contract is awarded on unit prices, work can be done much more economically, and with less plant and capital than with the other methods of payment. The unit prices are not only cheaper for the owner, but are also better for the contractor.

On the job the author has in mind, the payment was on unit prices and the materials were produced by the contractor.

Traction engines and steam wagons were to be used for the hauling, and these were ordered at once, as was a rock crusher, with the necessary boiler and engine, screens, etc., making a complete crusher plant. A few words as to the selection of this plant.

It is obvious that a roller is not needed at the start, so that if a roller and engine both have to be purchased, it would seem the part of wisdom to select a machine that could be made to do service both as a traction engine and a roller; then it could be used as an engine for hauling until needed as a roller. If the contractor already owns a roller, the new machine could be used as a traction engine and towards the end of the job when an extra roller may be needed it could be changed into a roller. This is in line with the idea of keeping down plant cost and adapting machines whenever possible to more than one class of work.

The steam wagons purchased were all side dumps. For many purposes these are too high, nor will they spread the crushed stone as the bottom dumps. Thus it was a mistake to have purchased all wagons of one kind. A few should have been side dumps and the rest bottom dumps.

The crusher instead of being a high type should have been a low down one capable of taking fair sized rocks, as for most road work this type is preferable.

The grading outfit was shipped to the job at once and this work started, while the necessary arrangements were being made to quarter the men and teams. A barn was rented for the horses and the men boarded at the various farm houses. A camp might have been more advantageous but that is commented upon in Chapter VII of Volume I.

But little of the road to be rebuilt had macadam on it, so that a plow was used for loosening the material. The excavation was light, seldom running over two feet, and for short hauls wheeled scrapers were used for the work, but for long hauls, half a mile or more, dump wagons were used, being loaded by hand. A better method would have been to have used four-wheeled scrapers, as these would have been economical both for the short and long hauls and would have eliminated the hand loading. Their loads, too, nearly equal that of the dump wagons in common use.

If the grading, though, runs into much yardage, a small steam shovel with dump wagons will be found economical in handling the excavated material, and for heavy work, the wagons can be operated in trains, drawn by traction engines.

As soon as the excavation work is started, the concrete construction should be looked after, and all pipes for culverts and similar materials should be purchased. One great drawback on

most work is not to have the culvert and bridges finished on time, leaving breaks in the finished road surface that must be done afterwards. These and other items caused by such delays add to the cost of the work. Where pipes or corrugated steel culverts are used, they should be laid as soon as the grading is finished, and if they are placed in embankments, as is generally the case, the culverts should be fixed before the bank is made.

For the concrete work, the foundation excavation should be made as soon as possible and the forms and construction materials placed ready for work. Concrete mixers and other necessary plant should likewise be installed so that this work goes on according to schedule.

Much of the hauling of all materials can be done with the traction engine and steam cars, at a much lower cost than with horses. With a sand pit located at the start of the job, all of this material can be hauled early for future use, so that when other hauling must be done, work will not be held up on account of lack of sand.

As soon as the rock crusher arrives it should be set up for work. If the quarry is near the line of the road, the crusher plant should be placed at the quarry, but if the quarry is a mile or more from the work, then it is better to install the crusher plant on the road and haul the quarried rock to the crusher. The weight of the rock will be approximately the same, but the mass of the quarried rock will be much less than when crushed, and this will mean less hauling. All the hauling of rocks, both quarried and crushed, should be done by the traction trains. This may mean the use of two trains.

With grading pushed ahead, the placing of the crushed stone can commence, as soon as the roadbed is dressed up with a road machine. Then the sprinkling with water or some bituminous binder can commence and the rollers come into play. The subgrade should always be rolled. This is not only a benefit to the road, but the contractor is benefitted by not having so much crushed stone pressed down into the subgrade.

Under this plan, the grading is started first and carried well in advance, then the culvert and the concrete work is carried on before or with it, then comes the finishing of the subgrade and the placing and compacting of the surface. This method scatters the

work over a long distance and prevents one set of forces from interfering with another.

If payments are made only on the finished road surface, then as soon as a short piece of grading is done it must be finished and the metal surface put into place, each class of work following the other in rapid succession. As it is not always possible to get in the culverts and concrete work ahead of the grading and surfacing, gaps must be left to be finished afterwards. This allows of estimates being earned as quickly as possible, but keeps the various crews so close to one another that they may often cause interference. This means an extra cost to the contractor and he must ask a higher price. The same thing is applicable to lump sum contracts.

If sand and crushed stone or gravel can be purchased at a reasonable price, it is generally more economical to buy it than to produce it, as it saves much plant and labor, and it can often be brought onto the job quicker, for a quarry frequently has to be stripped and developed before it will produce good rock. Then, too, small portable rock crushing plants are seldom as economical in operation as the larger commercial plants, and their output is likewise limited. When these materials are purchased a contract should be made for them in advance. This is easily done by obtaining prices on the amount needed, that is, stating the number of tons or cubic yards, using the term "more or less" and also naming the point of delivery. When the prices are made, write a letter accepting them, again stating the amount, "more or less," and the point of delivery, this being an offer and an acceptance making a binding contract for the job, unless a date limit is set upon it.

The same kind of a contract should also be made for cement, lumber and other materials.

As the work progresses, constant attention should be given to see that it is kept up to the time schedule and that the estimate of cost is not exceeded. This is most important, as the contractor's profit and reputation is bound up in these two things.

How to Start a Sidewalk Contract.

This kind of work is very similar to both street and wagon road construction. Such jobs are generally for a smaller amount of money than the other two, hence there is greater need of planning the work well if wastes are to be prevented. If a concrete

curb or concrete curb and gutter is included in the sidewalk contract, this part of the work should be planned separately and be kept well ahead of the sidewalk.

The excavation is the first work to be planned, then the base must be prepared. This may be the natural ground, which should be rolled so as to make a better pavement, and also save the contractor materials. Placing the forms comes next.

In nearly every case metal forms will prove cheaper than timber ones, and can be moved and set up quicker. This is true both for curb and gutter forms and sidewalks. In some cases for sidewalks, forms are not needed. The concrete work should be done with the small mixers and it should be planned to have a mixer on the job as soon as some of the excavation is made and the first forms set.

If the job is a large one and includes both curb and sidewalk, then there should be a small mixer for the curb work and another for the sidewalk. The finishing work should be carried along with the laying of the concrete.

Arrangements should be made to have stock piles of raw materials placed along the job at the various set-ups of the machines, or else to have the materials piled in windrows so that the mixer can be moved along a few feet at a time and be fed directly from the piles.

Too much hand work is now done on such jobs and they should be so planned as to eliminate this as much as possible.

How to Start the Erection of a Building.

Concrete construction has broadened the work of many contractors. Men who at one time confined their work to erecting buildings, have, through the use of concrete, undertaken contracts for many other kinds of structures, and many engineering contractors, due to the use of concrete for buildings, have erected a number of warehouses and factories.

Thus today a contractor must be versed in many kinds of work. It is an easy matter to begin work on a new job, but a rather difficult problem to plan out the start of a contract and how it should be carried on in the best possible manner, so as to obtain the very best results at the lowest cost.

It has already been pointed out how it is necessary to obtain prices on the various kinds of materials for the work. This must be done for buildings, and furthermore, if the structure is lo-

cated in a large town or city, and the material is to be purchased from local dealers, it must be understood whether or not the prices quoted mean for the material delivered on the job or at the dealer's yard or factory. A non-delivered price may add much to the cost of the material.

For building construction, many classes of work are sub-let to contractors making a specialty of certain lines, such as plumbing, pipe fitting, electrical wiring, plastering, painting, and so on, through a long list. Schedules of work to be done by such contractors must be prepared and submitted to them for prices. Many contractors allow sub-contractors to take off their own quantities of work to be done, but this sometimes causes disputes, as quantities are omitted, and it is difficult to compare the various prices. With the quantities submitted to each sub-contractor being the same, there can be no disputes, and comparisons are quickly made. There are other reasons for making up these schedules. The contract secured, acceptance of sub-contractors' prices must be made at once or contracts signed with them. These and other details attended to, the contractor is ready to start his job.

The first thing to do is to map out a plan for carrying on the work and arrange a time and money schedule.

Jobs are carried on without this kind of planning, but they are not as successful as those that are planned with great care. No matter how the job is run, the plant must be sent to the job so as to carry it on expeditiously. If the job is not run on a well thought out plan and time schedule, then all or the greater part of the plant needed will be sent to the job at the start, or just previous to starting the work. Thus, with but little space around the building for storage purposes, much of the idle plant will be in the way, and different pieces of machinery may have to be moved several times. The extra cost of moving and the cluttering up of the yard may frequently run into hundreds of dollars, a waste that can easily be prevented.

With the proper schedule, the outfit is brought to the job only as it is needed and is moved at once to the place where it is to work. This is the economical method. The same procedure should be followed with materials. This does not mean there should be delays waiting for deliveries, for this must be avoided.

For the materials, there should be selected beforehand places for delivery, and never should it be allowable to decide on storage

places on the spur of the moment, as then extra work is more than likely to be entailed. These are details that mean much on a building job. Materials little used are sometimes placed at most convenient places, while those always in demand are scattered on the outskirts of the job.

There are two general methods of carrying on building jobs. One is to do the work by stories or in series as to the various classes of work. This is the most common method. Under this system, the cellar or basement and the pits and trenches for the foundations are first excavated. The foundations are then put in place, when the basement structure is built. The structural work is then carried up story by story. Meanwhile the work of finishing is started in the lower stories. Thus the work is done in series.

The second method is to do the work in successive steps. This is by far the quickest and most economical method, and admits of planning the work to better advantage.

To illustrate how this is done, we will take for example a three-story factory building with a basement. It does not make any difference whether it is of concrete, steel, brick or timber, or a combination of two or three of these. The general methods will be the same, only the details varying.

The excavation work is started first and naturally the plant needed for this should be the first to be brought onto the job. The entire area of the site of the building can be worked on if the local conditions make it economical; but whether this is done or not, the excavation work should be centered on one corner of the structure and at this corner work should be pushed as rapidly as possible, getting down to the foundation. The selection of a corner for this purpose in some cases may not be of importance, while in other cases the success of the whole plan may depend upon it. Any corner that has special work upon it or may need materials that cannot be delivered promptly should not be selected. If there are no other considerations the corner should be selected that will not interfere with the continuation of the excavation, and the delivery of materials and plant.

As soon as the excavation is finished in the one corner, the foundation footings should be placed, and then the walls and structural work should be commenced. Meanwhile the excavation work is continued, and following close behind it comes the foundation work and then the rest of the building. As soon as a fair

section of the basement work is put in place, the first story can be started, and shortly after the second story work can commence. On a very large structure, it is possible to have one corner nearly ready for the roof before the first story is in place at the opposite corner.

It can be seen by a practical man that as soon as the first corner of the building is well under way the inside work and the finishing can be started. Thus a very large force of men can be employed and artisans of all kinds can be kept busy and can carry on their work together, instead of one class of workmen leaving gaps or waiting for certain parts of their work until another kind of artisan is employed. This method also means that a balanced organization can be built up. Each gang can be made of such a size that the cost of supervision will be reduced to the minimum, and the men will do the most economical work, instead of working excessively large gangs one week and during another week having the gangs so small that the overhead charges are excessive.

This method also allows of a more expeditious and economical delivery and handling of materials. It is not necessary to have such large deliveries made that extra large gangs must be kept busy, causing increased cost for delivery and storing, and sometimes rehandling. This is obviated by having smaller gangs with a regular output of work. The materials for the inside work can be delivered on the first floor just as soon as the second story is started, giving extra storage room, keeping such materials from being exposed to the weather, and saving time in serving them.

This method also allows of the most economical installation of machines. Each kind of a machine can be brought on the job as it is needed, and can be used to the best advantage. Thus a large derrick, set up in the basement, can work not only on the basement, but also on the first and second stories, without being moved, while by the other method the building of each story means a change in most of the machinery.

This method also means that the same gangs repeat the same operations again and again, allowing more system to be put into the organization and work. All economists and efficiency engineers concede the fact that when the same operations are repeated frequently the opportunity of eliminating waste is the greater.

This method of carrying on building construction is applicable to almost any size of building except such structures as

monolithic grain elevators and similar buildings. This method is ideal for a structural concrete factory building. For small square buildings it is not so well adapted, but can be used economically with some modifications. It is the only method that should be used for long rectangular buildings.

For a large plant consisting of a number of buildings, not only is this method applicable to each building, but also to the entire group of buildings. Instead of waiting until most of the excavation is made before starting the foundations, and then getting these finished before beginning structural work, work can be started on one corner of one of the outside buildings and carried on in series, so that possibly the first building will be under roof by the time the foundations of the last buildings are in place. In many cases this can not be done if one contractor is employed to do the foundation work and another the erecting of the buildings.

It is almost useless to describe the method of building in stories, as this is the commonest method used, and most contractors are familiar with it. It gives good results, but seldom is as rapid or as economical as the other methods. It is better suited to sub-contracting certain classes of work, but the sub-contractors can be broken into the other methods and will, in the end, find that it also works to their advantage.

There are many details as to the building construction that can not be covered at this time, but one feature that should be kept in mind on any contract work is the earning of monthly estimates. The work should be so handled as to earn enough money, after the first week or two, to carry the job. This demands the placing of material almost as rapidly as it is being received, and the keeping of the job in such shape that the amount of work done can readily be estimated.

How to Plan a Concrete Bridge Job.

Concrete is being used more and more for bridge construction, and contractors find it a practical field for making money. Each year, therefore, finds a larger number of contractors engaged in building concrete bridges and many contracting firms are beginning to specialize in concrete bridge construction.

There are a number of different methods of carrying on such

jobs, depending on the size and character of the structure. Under any circumstances, after the job has been obtained and the contract signed, the first things to be done are to arrange for the purchasing of the necessary material, to lay out the job with respect to methods and machines to be used and the storing and handling of the materials, and to obtain the plant. Inasmuch as all of these features have been dealt with for other classes of work, they will not be discussed here.

In planning the job, the size of it is an important consideration. A bridge with a small span of twenty feet or less can be classed as a culvert. The layout for such a job will naturally be much simpler than for a larger span, or for a structure having several spans.

The short span bridges or culverts may be of the girder type with a flat concrete floor, or steel I-beams may be used instead of concrete girders. The arch type of bridge and culvert is a favorite one with engineers, and is used almost exclusively for long spans.

For short spans, the foundation excavation is seldom difficult, and in most cases is done by hand methods with the aid of a gasoline pump and a derrick. A derrick with about a 30-foot boom can generally be set up on one side of the bridge so as to cover the entire job. Such a set up will allow its use both for the foundation work and for the concrete construction. The concrete mixer can be set within reach of the derrick and the concrete handled to the forms in buckets.

On many small jobs a derrick may not be needed as the mixer may be set up on some blocking and enough fall obtained to serve the concrete in chutes by gravity. The tendency on these small structures is to do too much work by hand. Naturally a small job will not admit the use of a large amount of plant but careful estimates should be made to see which is the cheaper, hand methods or the installation of the proper kind of plant.

The first work, no matter what the size of the structure, is the foundation excavation. The method of excavating and of handling the excavated material on long bridges may depend upon the general methods and plant adopted for the job.

There are now in use at least four distinct methods of building concrete bridges: by means of industrial tracks laid in sections and small V-shaped steel cars; by means of derricks alone; by means

of cable ways, and by the use of a concrete hoisting tower and chutes. Other methods have been used, but not in a large number of cases. On a few bridges, belt conveyors have been employed to carry the materials and place them. The character of the forms to be used will also cause variation in the methods.

When small cars are used, the first work is to install the tracks on the ends of the bridge and at once to build a small trestle across the site of the bridge so that the cars can be taken to the piers and abutments. In arranging this track, the entire layout for the work from the start to finish should be considered so that the track on either end need not be relaid, but only shifted slightly to suit changing conditions. This may mean the saving of much labor during the life of the job. If the bridge is to span a stream, the excavated materials may not have to be hauled away, but can be thrown into the river, unless it interferes with navigation. If the water interferes with the excavation, then some form of cofferdam must be used. For very shallow water and excavation, all that may be necessary will be the placing of some sacks, about the size of cement bags, filled with sand, against which puddling clay can be placed. This, with a pump, may keep the excavation dry and allow the concrete foundation to be placed.

In deep water a regular cofferdam will have to be built. This will be either of timber or steel sheet piling, and in some cases must be made double, using puddling to make it watertight. On such cofferdams efficient pumps must be installed, and those which can pump water with grit in it. If only sand has to be excavated, this can sometimes be done, if it can be stirred up and kept agitated, with a centrifugal pump, pumping out both the sand and water. If the cofferdam is of considerable depth and the material has to be shoveled, a derrick must be set up on the cofferdam, or a scow with a derrick placed alongside. The derrick will hoist the buckets and dump the material in the water, or, if this is not possible, into the cars to be hauled away.

As the pier excavation is going on, that for the abutments can be started, especially if they are located in the dry. Different methods may be used for this part of the excavation. Meanwhile, other plant should be assembled. If wooden forms are to be used, lumber must be brought to the job and the framing of the pier and abutment forms started. If heavy centers are to be built, power saws should be installed, so as to do the sawing by power

instead of by hand. This framing of the forms should be done as close as possible to the bridge, yet not so close as to interfere with the mixing and placing of the concrete, for this is the work that must be handled in the most efficient manner.

The storage piles for the concrete aggregates and a cement house must be provided before the excavation is completed, and the concrete mixer must be set up, so that as soon as any of the foundation pits are ready the forms can be set and the concrete placed immediately, so as to prevent possible floods from filling the coffer with dirt and trash. A delay at this stage of the work may mean the loss of many dollars, and every effort should be made to handle the job and push it so as to get the foundation above the ordinary high flood height. Thus it is also necessary that the reinforcing metal be secured early and those pieces that are to be imbedded in the foundation shaped and worked so that this part of the job is handled promptly and correctly. The strength of the structure is in a measure in these rods and if they are not placed correctly the bridge may fail or be condemned, causing a great loss to the contractor.

The force employed at this time should be large enough to place piles or other supports for the false work to carry the centering and forms for the arches, for these should be placed as soon as the foundations are finished, so that during the period of low water all work is thus carried above the flood mark. Then the great work of setting forms and concrete can go on unhindered.

When the foundations are placed, the false work material can be carried to place on the industrial tracks by means of flat cars, before this track is taken up and laid over the top of the forms. With the forms once in place and the track relaid over the top of the bridge, the concreting of the arches can begin.

Many engineers will not allow the contractor to use his own discretion in this, but will have the arches cast under their own instructions. Generally this is done by casting the arches in a number of monolithic rings from springing line to springing line, and then casting the spandrel walls. The author's preference is first to cast the up-stream spandrel wall with a fair sized ring of the arch, even if this work must be kept up continuously for more than 24 hours, as then the arch is made strongest where flood water and the debris carried in it strikes the bridge, preventing the structure from being wrecked. More concrete structures

have been wrecked owing to a weak point at this part of the bridge than from any other cause. After the spandrel wall and first ring is cast, the rest of the arch can be built as usual.

This class of concrete construction should be carried on as much like clock work as possible. Large supplies of concrete materials should be kept on hand, so that no delays will occur because of lack of them. The reinforcing steel should be shaped and put in place as early as possible. It is well to detail a man or two to see that this is done properly. Just as important is the form work, which must be kept ahead of the concreting.

Derricks can be used in place of cars for serving materials, but the work is much slower on long spans or when there are several spans. For a single span of reasonable length one large derrick or two smaller ones can be used, and excellent work can be done, for the foundations can be excavated and the concrete placed with the derricks. The false work can also be set in place with derricks and if piles are needed they can be driven with a steam hammer hung from the derrick boom. The centering can also be placed with derricks and the concrete handled in dump buckets. The concrete mixer can be fed with a derrick and a grab bucket, instead of using track and cars. The author believes that derricks can be used to advantage both separately and with cars, but a derrick or two and cars make a much cheaper outfit than a large number of derricks. Even with the cars, a hoisting engine or two is needed, as the cars must frequently be pulled up an incline, so that it is possible to use the derricks for the foundation work and afterwards use the hoisting engines in operating the cars. A number of cars can be purchased for the cost of a hoisting engine and derrick.

The general sequence of the work of building a bridge is about the same no matter what kind of plant is used, the selection of the different kinds of outfit depending on the local condition and character of the structure. The same general methods and plant are not economical for every concrete bridge.

There can be no doubt that cableway for a structure several hundred feet long is very valuable and will effect many savings in carrying on the foundation work. Strung across a stream both material and plant can be moved back and forth without interference by the water, and work can be done as long as cofferdams are not flooded. False work can also be placed with a cableway

during a high water stage. Concrete can be handled and placed with a cableway, but not as rapidly as with cars, for the traveler must go forward and come back before a second load can be carried, while with cars the tracks can be so arranged that two cars can pass.

The fourth method of building concrete bridges pertains only to the distribution of the concrete, namely, by a hoisting tower and concrete chutes. With this method the concrete can be placed in the entire structure at a small cost, but other plant will have to be used for the excavation and for serving the mixer with raw materials.

There are some cases where the use of a concrete tower means the saving of much money and where all the other methods would fail. One such case is that in which the mixer must be set under the bridge, the tower being alongside. Here the concrete is elevated and distributed in one operation, even after the mixer is shut out of view from on top of the bridge.

Belt conveyors can be used either to serve new materials to a mixer or to distribute the concrete. They operate either on a level or on an incline. By their use, stock piles can be kept in a limited space, and materials brought from the piles to the charging hopper. Even when not used for stone and sand, belt conveyors may be used to transport cement from the cement house to the mixer.

There are some bridges that admit of economical work being done by any one of these various methods, but in most cases the best layout of plant can be made by a combination of these various methods. Thus a cableway can be used with derricks under it. Cars can be used with either derricks or a cableway or in conjunction with both. A concrete hoist and chutes can be used in connection with any of the other devices for excavation and placing the false work and forms. The same is true of the belt conveyor.

In laying out the work it is necessary to make a ground plan and also a side elevation of the bridge and the adjoining ground. Upon this plan the location of each machine and of the stock piles can be placed. The routine of the work and handling of the materials can be indicated, so that the superintendent will have all of these things planned out for him. Then he has only to follow the plan and directions and to see that the proper progress is made and that the construction is done in a first-class manner.

How to Plan a Masonry Dam Job.

Times and conditions surrounding construction work change rapidly, and with these changes come different methods of doing work. Six years ago the author, after some months of exhaustive study of masonry dam construction, wrote an article on planning such a job, with some notes on equipment. He found that there were then three general methods of carrying on such work; but in this short space of time a new method has been evolved, so that today there are four general methods that can be used. These will be brought out and commented upon.

The size of the job will govern the plan to be followed and the plant to be used, as will also the kind of masonry to be employed in the construction of the dam. Masonry dams are built of heavy rubble masonry throughout, of rubble masonry faced with ashlar blocks, of concrete throughout, of concrete faced with stone masonry, of concrete faced with large concrete blocks, and of concrete with large boulders in it, known as boulder concrete or rubble concrete. This type may also be faced with stone or concrete blocks. Some concrete dams are built of reinforced concrete, and are designed in some type of hollow dam, some of which are patented.

Masonry dams are almost without exception built across the bed of a stream. Thus the first work to be done is to take care of the flow of the water. For a small stream, this can be done by building a temporary dam above the one to be constructed and diverting the water through a canal or flume of some kind. Where rock is close to the surface of the ground, the flume can be run through the dam to be built, being supported temporarily until the foundation is excavated and built up to it. After the dam is complete this flume, if of metal, can be filled with concrete. If the amount of water in the stream is too large to be cared for by this means, then cofferdams must be built in sections, allowing the water to go around the cofferdam, until the final closure is made, when the stream is cared for by the flood gates which have been previously built. The care of the water is one of the first considerations and the future plans must be based somewhat upon this. It is seldom possible to take care of the extreme flood stages of the stream, but a study should be made of this feature of the stream and provision made for small rises and

the work planned to make outfit and masonry safe against extreme flood stages, although work may have to be suspended at times.

Small dams that can be completed in a few months or in one season can be carried on with less plant and on a much simpler plan than larger structures that may take a year or two or possibly from five to ten years. The new Croton dam for part of the water supply of New York City took more than thirteen years to build. The size of the dam or the length of time necessary to build it does not affect the general method of carrying on dam construction except as to details. There are many examples of dam construction to be found in America, from the small dam a few feet long to the world's greatest masonry structures with about a million cubic yards of masonry. These large dams have been built for either power or storage purposes for drinking water or irrigation, so that they are scattered over the entire country and anyone interested can easily make a study of methods. New York City is at present, in connection with its new water supply from the Catskill Mountains, building two very large masonry dams, one at Ashokan, and the other at Kensico. The world's record for rapidity of construction has been broken at the Kensico dam.

After caring for the flow of water, the next work to be done is the excavation for the foundation and the preparation of it to take masonry. Not only must some kind of a cutoff trench be made and filled with waterproof hydraulic masonry, but seams and fissures in the rock must be blown out and stopped up to prevent the seepage of water under the dam. This work cannot be done until the excavation is made.

Small jobs where much earth occurs can be done with scrapers until the rock is encountered; but in most cases for both large and small dams, mixed with the earth is a large amount of gravel, boulders or loose rock and toward the bottom of the excavation often shale and rotten ledge rock. Then, too, the excavation is generally wet. If cofferdams are to be used these must first be put in place.

The author cannot at this time go into a discussion of cofferdams, but will sound a few warnings. Plans for cofferdams should be made and followed. In order to have these dams efficient they should not be placed as though the proposition was an easy one, but rather on the supposition that trouble is to be encountered;

then the cofferdams will be planned and placed properly and will serve their purpose. Thousands of dollars are wasted annually by make-shift cofferdams. These dams can be built entirely of timber, or partly of timber and steel, or for some work of steel interlocking, watertight sheet piling.

When there is much rock or hardpan in the excavation a common method is to make the excavation by hand, shoveling into skips or buckets operated by cableways or derricks. This is one of the most expensive methods, especially for large jobs. For a very limited amount of excavation such a method may prove the most economical; but whenever the amount of excavation justifies it some kind of a power excavator should be used. A power scraper or an orange-peel bucket can be used with a derrick or derrick car, and under some circumstances a dredge can be employed for the excavation. The machine that has been used most extensively on large dams has been the steam shovel, either loading cars or skips.

Inasmuch as this excavated material must be transported, and at times for quite a distance, the contractor must face at once the general methods of constructing his dam. As previously stated there are four distinct methods of building dams.

The first method is by means of one or more cableways spanning the length of the dam.

The second is by means of derricks placed on the dam, either on steel or timber towers that are embedded in the masonry, or derricks set on the masonry itself or adjacent to it and moved at frequent intervals.

The third method is by means of a trestle built on the upstream face of the dam for trolley tracks on which run electrically drawn buckets, for railroad tracks or for other means of transportation, such as wagons and carts. Derricks are set up on this trestle, on the masonry or on tracks built on pilasters on the dam, which become a part of the masonry construction.

The fourth method used for concrete dams is that of concrete hoisting towers and chutes for conveying the concrete from the mixer to the forms.

It is evident that these four methods can each be used separately, or that a well-devised plan of building may take two or more of these methods, with slight changes as to details, into con-

sideration, in order to obtain the quickest and cheapest method. It is needless to say that this procedure is frequently followed.

With each method comes the consideration of an adequate pumping plant, whether on a large or small job. As the excavation progresses, a pumping plant, capable of handling all the water that is likely to be encountered, should be installed, and alongside of it an auxiliary plant of the same capacity for possible breakdowns, floods and other emergencies.

For a job of any magnitude it is also advisable to build on the job a machine shop so that repairs can be made quickly and the many machines kept in first-class working order. The amount of plant needed on a job of this character is large, and can vary from a few thousand dollars to many hundred thousands. The plant on the Kensico dam is said to have cost about a million dollars. The contracting firm doing this job always has a modern and up-to-date plant, and has been very successful in carrying on large contracts; but if they err in this regard, it is a tendency to have too much plant, making their overhead charges excessive and eating up some of their profits. However, more contractors lose money by a lack of plant than by having too much. The need of a well-equipped repair shop for heavy work is seen at once for plants of this size.

Two other features must also be looked after in starting the construction of a dam. One is the handling and storing of materials. There are cement, iron and steel, stone and sand, lumber, coal and many other heavy supplies to be cared for in large quantities. For small jobs wagon roads may have to be built to haul upon, and for large jobs a spur line railroad. Quarries generally have to be opened up and developed, and sand pits obtained or sand may have to be dredged or shipped to the work. These are important things that will not brook delay.

The other necessary thing to be provided is a central power plant. The work on a dam is generally confined to a limited area; and with many kinds of machines to operate, a central power plant is much cheaper, in both the cost of installation and operation, than a large number of single units. The writer has known of jobs on which more than 75 derricks were used, so that a steam boiler operating for each derrick meant a large expenditure. A central power plant can be operated with steam, carrying steam direct, or converted into compressed air or electricity. Each power

has its advocates and all three have been used successfully. Today electricity seems to have the preference, and a favorable feature about it is that electricity can often be purchased from a power company instead of being generated, and at times it can be generated by waterpower from the stream that is being developed. In most cases it is more economical.

For concrete dams, forms must be provided. The merit of both timber and steel forms must be looked into at an early date and a decision made as to which shall be used. Then the forms must be made and placed on the ground for use. If the faces of the dam are to be of concrete blocks, then forms will not be needed; but a yard must be laid out for making and curing these blocks and it must be equipped with necessary plant for manufacturing and handling them. A large supply of the base blocks must be made and cured early if rapid work is to be done on the foundation.

It is always difficult to decide which of the four general methods of building a dam shall be used. The method that seems to appeal to many contractors is that of cableways, with derricks under the cableways. This allows the entire structure to be spanned even if it is several thousand feet long. The cableways at the Spier's Falls dam on the Hudson River were about 2,300 feet long, which record still stands as the longest operating span of this kind.

A cableway carriage must deliver its load and come back to the supply point before taking another load. This, with lost time, reduces the efficiency of a cableway to less than 50 per cent, seldom more than 40 per cent. With a limited load this means slow work. Then, too, the reach of a cableway skip or bucket on either side of the center line of the cableway is limited, so that to make the cableway more efficient, it must have traveling towers. And again, in order to get a large amount of work done, two or more cableways must be installed. With derricks under the cableways to relieve the cableway of its load and to cover a wider area, the entire plant becomes much more efficient. One great advantage of a cableway is the ease with which derricks and other equipment can be raised from one elevation to another and moved at will. With large cableways, it is even possible to move steam shovels and dinkeys from one part of the job to another, saving much time and money.

These are the general disadvantages and advantages of cable-

ways, coupled with the fact that they can be located outside the danger zone of floods and can be used quickly to save other plant from being swept away by high water in the stream.

The methods of using timber and steel towers for supporting derricks, which towers are embedded in the masonry, has not been used extensively. Steel towers were used on a part of the new Croton dam, and rapid work for those days was done by this method. It was specified for use in building the Cross River dam for the City of New York, but the successful contractor used cableways with derricks under them in preference. The objection to the towers is the great expense that either the owner or the contractor must stand, so indirectly it is still the owner, without any salvage on the towers, while by all other methods the plant can be reclaimed at the end of the job.

The use of trestles and tracks and similar devices is one of the best methods for large and small dams. The trestle, if there is only one, is built on the upstream face of the dam. If more than one are used, they may be built on either face, or even across some parts of the dam until the structure obtains a great height. Derricks are sometimes set on the trestles and also on the masonry, or on both. With low dams, derricks may not be needed, but concrete is delivered in cars or buckets on cars or operated on a trolley track supported by the trestle, and dumped directly into the forms.

There are many variations of this method, and some large structures have been built by it. The McCall's Ferry dam was done by this method, the materials being handled by specially designed cantilever cranes instead of derricks. For the foundation work a large number of supply tracks can be used, and even when the structure has been reared to some height two to four tracks can be laid on the trestle. Belt conveyors can also be rigged on the trestle to bring certain supplies to the dam.

It can be seen at once that this trestle, besides providing room for trains, can also be used for tracks on which moving derricks or travelers can operate, or these can be operated on the dam on small piers or elevated track and served by trains on the trestle.

This method, too, can be used in conjunction with the two other methods. That is, with towers supporting derricks and with cableways. The great progress made on the Kensico dam has been due to a combination of these methods. Cableways were put in place at the start. They assisted in the excavation, but for

the masonry they were used almost exclusively for shifting plant. Supply tracks were run alongside the dam and across it. Supply trestles with pockets for materials and conveyors for bringing in supplies were all used to serve derricks mounted on movable travelers, the track for them being supported by concrete piers that were pre-moulded and placed by the cableways. The record of masonry placed has been phenomenal. The world's record of 36,000 cubic yards of masonry placed in a month at the Cross River dam was broken at Croton Falls Dam No. 2, by placing more than 40,000 yards a month; but this has been exceeded at Kensico, first by 48,520 and then by 53,240 cubic yards, and promise is given that these records will be broken.

The method of hoisting concrete and depositing it with chutes has not been used extensively as yet on dam construction, as this method, used originally on buildings, has been in vogue only a few years, but it will be used more and more and promises to be an economical method. With cableways to assist in supporting the chutes it can be used on breast of dams of some length. It will save the placing of much machinery that will be in danger of being swept away by floods.

Constructing an Ordinary Reservoir.

The contract secured for a reservoir, the first thing to do it to make up a working plan and map out a progress chart of the job. The site of the reservoir has already been visited, when bidding upon the job, so that these things can be done from the notes taken at that time and from the engineer's plans. This working plan and schedule of progress will include the plant needed and the time of placing each machine on the job; but this subject has been dealt with previously.

These things done, the contract signed and the bond made, the job is ready to be started. Such a job usually consists of earthen dikes with some kind of a core wall, a masonry spillway, a gate chamber or house, with the outlet pipes or aqueduct to carry away the water, a spillway, and in some cases a masonry dam, but the latter has already been discussed. The general methods of doing the work is the same, whether the job is large or small, varying only with the kind of outfit or plant used.

The first work to be started, and the one from which money

can be earned from the beginning, is the stripping of soil from the site of the dikes. This has to be done for two reasons; first, to allow a compact base to be put in so that water will not seep under the hydraulic embankment; and again, soil is needed to place over the top of the finished embankment and the outside slope.

For this latter reason, piles are made of the soil outside of the embankment, and these piles should as far as possible be so placed that the climb to place the soil will be reduced to the minimum. Thus the piles should be made near the ends of the embankment. They should be made about 20 feet high and not scattered over too large an area.

While this work is being started, a camp can be built with the necessary stables, shops and other buildings. If the camp is started a day or two in advance of the other work, then the men and teams can be cared for from the start, but a completed camp does not have to be built before starting work.

As soon as the stripping is started, the trench for the core walls should be excavated. The progress of the entire job is dependent upon the core wall work, for the dikes cannot be built properly until the foundations are in for the core walls and they are above the ground. Core walls are not absolutely necessary for reservoirs, as the United States Reclamation Service has built a number of high dikes for reservoirs without core walls, and so far these dikes have proven to be perfectly watertight. However, the New England Water Works Association and the American Water Works Association advocate the use of core walls, so most engineers follow this practice, although the cost of a core wall adds much to the cost of reservoirs. Core walls are made either of selected earthen material mixed together and compacted, making a very dense mass, of stone masonry, or of concrete. Today the last named material is the most common in use for core walls, so we will consider that they are to be of concrete.

The machines that can be used to do the stripping are many, besides using hand methods. Wheeled scrapers, both two-wheeled and four-wheeled, can be used. They can also be utilized to load dump cars, through a trap, when the cars can be hauled in trains to the stock piles. Elevating graders and wagons can be used in some soils for stripping. Small steam shovels can be used in any kind of soil and these can load wagons or cars. Some types of ditch machines can also be used for stripping, using wagons.

Power scrapers or drag-line scrapers can be used for stripping and also for placing the soil back on the finished embankment if the work is planned properly. If these machines are used, then the soil is piled in a long pile at the base of the embankment, at the toe of the outside slope, so it can be picked up again and distributed over the embankment.

The size—width and depth—of the trench for the core wall will govern the kind of machine to be used for this excavation. Trenches less than 5 feet wide and not more than 20 feet deep can be excavated economically by trench excavators, like those used for sewer trenches, or trench machines of the Carson or Potter types can be used, or steam shovels with a long dipper arm can be employed. Cableways can also be used and are especially adapted to deep trenches, such as those in the bed of creeks that must be carried down to bed rock. Derricks can also be used, while for wide, shallow trenches, scrapers can be employed. It is often possible to start trenches with scrapers while other machinery is being installed. Drag-line scrapers, and also grab buckets—orange peel and clam shells—can be used for excavating the core wall trenches. If the material from the trench is suitable it can be placed in the downstream side of the embankment, if the stripping has been done promptly, thus saving money either in rehandling or in extra haul, in order to dispose of the material. If it is not suitable it must be carried to a waste bank.

When starting work on the core wall trench, a quarry must also be opened up for crushed stone, crushers installed and the concrete plant made ready so that the wall can be started as soon as one section of the trench is excavated. If stone is not to be quarried, but purchased, or gravel is to be used, then these things must be arranged for promptly.

With the stripping under way, the core wall trench being excavated and the crushed stone or gravel provided and the concrete plant in operation, the real work of building the dikes can commence. Two classes of material will be needed for the dikes. For the upstream side to the core wall a selected impervious material will be needed, and for the down-stream side any good material, although if the impervious material is found to be as cheaply obtained and is plentiful it will be used on both sides. If an impervious earth cannot be found in the neighborhood, then it will be necessary to excavate several classes of earth and mix them

together, before compacting them to make a material impervious to water.

Thus the various borrow pits must be located and developed so that both sides of the dike can be brought up at the same time. If absolutely necessary, breaks can be left in the core wall for trains and teams to pass through, but this is bad practice; and if possible the borrow pits should be so located that the material can be hauled to either side of the core walls, which should be built continuously.

From the up-stream side, stones above a given size must be excluded, and if this is not to be done by hand, then some method of excluding these large stones must be arranged before the excavation commences. This can sometimes be done by dumping the excavated material over a grill work, thus screening out the larger stones. The methods of excavating the material from the borrow pits is done by various kinds of machines, but steam shovels seem to be preferred over most other types of excavators.

These shovels have been used to a great extent in connection with trains for transporting the earth. Good work has been done in this connection, but the cost of spreading the materials on the dikes and the heavy expense of shifting and rasing the tracks has shown the need of improved methods along this line. Fortunately there are today several methods of transporting earth that can be used to reduce these costs. Large capacity 5-yard dump wagons, operated in trains by traction engines, are well suited for serving steam shovels, and they can spread and compact the earth in layers at a very low cost, much less than by cars. The service can at the same time be just as efficient. Another method that will save track shifting is the use of automobile trucks and trailers. These are of large capacity and can climb steep grades, while they are more rapid moving than the traction engines, and at times than the trains of cars. It is necessary, though, that good roads or runways be kept up for these trucks and trains of wagons.

As the banks are built up the raprap work on the up-stream side should be carried along with the dike building, as money can be saved in placing the stone work. If the inside slope is paved with concrete, then the concrete must be placed in long sections and this cannot be done until the dikes are nearly finished.

When the dikes are well under way the spillway and the gate chamber or house must be started. The conduits under the em-

bankment must be placed before the embankments are built up. The spillway will likely be of concrete, so for that a special mixing plant may have to be installed. For the gate house, valves, gates and other appurtenances must be installed, and it will be necessary to see that they are on the ground in ample time.

For the concrete work there should be built an open carpenter shop in which power saws, planers and boring machines should be placed, to be used in making the various forms, unless steel forms are to be used. Unless these details are looked after there are bound to be delays, and on reservoir jobs delays may be very costly. Those who have never done this class of construction must remember that continuous work cannot be done on the dikes. During the season, rainy weather will stop the earth work for several days or a week; and during the winter, both the concrete construction and dike building must be suspended for several months. Thus a delay waiting for materials or appliances may mean that the work will be thrown into the winter season, making it impossible to finish it until after good weather comes in the spring, causing the overhead charges to be high. Even if the job is large enough to last over several seasons, delays may cause the winter season to do damage to the construction because it is not carried to the proper stage.

Another important detail in starting a job of this kind is to be ready for the work of compacting the layers of the embankment. If it is essential for one part of the dike to be compacted more than another it is the base; for if trouble occurs it is likely to be near the base. Most specifications call for sprinkling, and it is not only necessary to have sprinkling carts or a pipe line with hose, but the pumps and tanks to furnish the water supply must be provided. This in itself may take considerable time and involve a large outlay of money.

The compacting will have to be done by rollers that conform to the specifications, and this may mean those with corrugated wheels. A contractor may already own several rollers, so he must read the specifications carefully to be certain that those he has will suit the job, or see if he will have to provide new ones, or possibly new wheels for his old machines. This may affect the cost of the work.

If clearing of trees and houses and the grubbing out of roots and stumps must be done on part or all of the site of the reservoir and dikes, this work must be arranged for early, for the other work

cannot be done until some of the land is clear; but as a rule there will be some open country in which to start the excavation and stripping, while the work of clearing and grubbing of the rest of the site can go on. It must be remembered that the clearing and grubbing on such work as reservoirs is much more expensive to do than on wagon roads, railroads and similar jobs.

One advantage of reservoir jobs over many others, such as canals and railroads, is that the work is confined to a limited area, so that the contractor and his superintendent can go over every part of it each day and keep in close touch with all details. This prevents small things from being overlooked, and it likewise allows all the work to be done from one central camp or office.

Planning Sewers and Water Pipe Laying.

In starting a sewer contract, there will be found a difference in planning and laying out the work, when the job is in a small town or city, in the suburbs of a large city or in the business section, where the street traffic is congested. But little of the street can be taken up under the last conditions, so that everything must be confined as much as possible as the work is likely to be interfered with by teams and people. In undeveloped sections of cities and small towns, the streets are not likely to be paved, and the contractor will not have so much to interfere with him. Nevertheless he will find the streets muddy in wet weather and this will make the work cost a little more and interfere with handling materials.

Layouts will vary, depending upon whether the sewer is to be built of some kind of pipe or is to be built in the trench, of brick or concrete, or a combination of the two.

When pipes are used, the planning of a sewer job varies but little from that of one for laying water pipes, except that the water pipes are much heavier to handle. The general methods followed in the work should be very similar. Naturally with pipes the trench can be closed up very much quicker than when a structure must be built in the trench.

The first decision that must be made is regarding the method of making the excavation. Hand work, in spite of all the machinery that is on the market, is still the most commonly used method. It is certainly the most expensive, and for that reason some other method should be adopted, whenever possible, but on very small jobs hand methods are likely to continue.

Besides excavating by hand there are on the markets the following machines that are used in connection with excavating trenches: small hand, horsepower, and steam and gasoline derricks for raising buckets from a trench. Some of these derricks have a mast and boom while others are either A-frame or tripod derricks. Some type of dump bucket is used with these derricks.

Portable cableways are also used for trench excavation. The same general method is followed as with derricks, that is, dump buckets are loaded by hand, but the back filling can be done by the cableway. These cableways have spans varying from 200 to 800 feet.

There are also on the market two makes of trench machines. These have bents supporting an overhead track upon which are operated dump buckets either as single units or one or more coupled together. These dump buckets are loaded by hand. As with cableways the excess dirt from the trench can be dumped from the buckets into wagons and back filling can be done with these machines.

Grab buckets of the orange peel type can be used in excavating sewer trenches. These can be operated on derricks or cableways and the author believes that the smaller sizes could be used on the trench machines. The efficiency of the derricks, cableways and trench machines would certainly be greatly increased with the use of orange peel buckets.

Narrow trenches up to five or six feet in width can be excavated cheaply with trench excavating machines. These are of two types: a traction device with a wheel with excavating buckets on it, limiting the range of work that a single machine can do, and another type with excavating buckets or teeth on an endless chain or elevator, by which a trench of varying depth, and with some machines of varying width, can be excavated. To these machines a belt conveyor device can be attached so that back filling can be done behind the machine as it is excavating. With these machines hand work is done in placing the sewer in the trench, unless they are followed with a trench machine of the other type, as is not the case with derricks, cableways and the other trench machines.

For very wide trenches a special type of steam shovel can be used for excavating. These can be mounted on rollers or special devices for moving them and are equipped with long dipper arms.

Several of the shovel manufacturers now make shovels for trench work that have a large range of work and excavate trenches more than 20 feet deep.

Drag line excavators are also used for sewer excavation. A trench as wide as that dug by steam shovels can be made with these power scrapers, and one of much greater depth. Heretofore the deepest trenches have either been made with derricks or cableway or trench machines, as the limit to their work is only when the sewer is laid so deep that it is cheaper to build it in tunnel.

Tunnel methods of building sewers will not be considered, as these are for special jobs, as is the case with building cofferdams in the trench where muck and quicksands are encountered and a centrifugal pump is used to excavate within the cofferdam.

If hand methods are decided upon, there is not much to do in deciding upon the plant for a job. Small tools for excavating will have to be provided and timber, when it is necessary to shore and brace the sides of the trench, will have to be ordered in time to have it as the excavation is carried on. The contractor should figure out the excess dirt that will come from the trench, so that this can be loaded directly into wagons when the trench is first opened up, doing away with rehandling it later and not having it in the way of the other dirt that will have to be placed on the side of the trench.

No matter how the work is done this excess dirt should be gotten rid of promptly to save extra costs. This must be arranged for in planning the job. For hand work, the forces should be so arranged and the work planned to do a certain length of sewer in a day or if it is pipe laying, to place so much pipe in the trench in a day. This means to have an excavating crew, a gang laying pipe or building sewer and a back filling and cleaning up crew. By this method some work is completed each day and thus some estimate is earned. The trench is kept open only the shortest time possible, causing less pumping and extra work.

Arrangements must likewise be made to put in manholes and special work in regular order, instead of leaving these places open to collect rain water and cause extra trouble. By arranging for the materials well in advance, brick, cement, sand, crushed stone, iron, plates and other supplies can all be on hand and the special

connections and manholes built without delay, leaving a completed job behind the crews.

In most trench work some pumping must be done. Hand pumps even for a small job should not be considered. For a small amount of water diaphragm pumps operated by a gasoline engine should be used. The cost of operation is seldom over 25 or 50 cents per day and this means saving the wages of a man or two. Centrifugal pumps should be used for water in large quantity, and pump points in quicksands with a duplex pump. Have the pumps on the job at the start so that bailing with buckets will not be necessary, for once started, men will keep this up as it is easy work as compared to digging.

If machines are to be used in excavating the trench, the type and size must be decided upon and the amount of work they can be depended upon to do daily must be considered so as to be able to determine what crews must be hired. This machine must be arranged for as soon as the contract is awarded so as to prevent hand work from being done and to allow the job to be started promptly.

The sequence of events will be the installation of the excavating machinery, then the beginning of the excavating, with which must come the placing of the shoring and bracing. In very soft materials and in tidewater flats or in marshes, the shoring may have to be placed before the excavating is commenced. If sheet piles have to be driven a decision must be made early as to whether steel or timber is to be used. In most cases steel sheeting is preferable. For driving, either a small steam pile driving hammer and a derrick or a regular pile driver must be provided. The pumps must be installed. These should be so mounted as to be moved quickly and cheaply.

If the sewer is to be built on piles, these must be on hand, with a pile driver of some type, to be driven as the excavation is finished. With the foundation in, the building of the structure can commence. For this, material must have previously been provided and placed at convenient points along the line of the work. If concrete is used a mixer or mixers must be placed. Before the concrete work is commenced arrangements must be made for the forms. For straight runs of sewers metal forms are generally to be preferred. These must be ordered ahead so as to be on the job when needed. If timber forms are to be used, not only must the lumber be provided, but power saws should be placed on the

job to do the sawing and thus cut down the cost of the forms, or the forms can be made in a shop and hauled to the job. Under no circumstances should the job wait for forms. This is a class of construction in which much ingenuity can be shown in hurrying the work and cutting down the cost. Some engineers and contractors have done excellent work in devising forms for sewer jobs and water conduits. This is one feature to commend metal forms, as the companies manufacturing these keep a corps of expert engineers, who have many intricate problems put up to them, so that these men learn much in devising economical systems of forms, and their services are offered to the customers of their employers.

Metal as well as wooden centering can be used for circular brick sewers. These if designed properly can be moved ahead without taking them out of the barrel of the sewer.

The forms on the work, the concrete construction can commence. A plan can be worked out for this either as a central mixing plant, or by placing the mixer alongside of the trench or over it. Too much concrete work is done on sewer jobs with very little system in the arrangements for the work. With cable ways or overhead trench machines a central mixing plant can be used and the concrete served to the forms in buckets. This can be done either for large or small sewers. Under some conditions it is the best and cheapest method.

When there is not some machine already installed to serve the concrete to the forms, then an economical method for a large sewer is to place the concrete plant on a platform over the trench. This platform is mounted on car wheels and moves along on rails laid down for the purpose. Small derricks on the platform pick up the raw materials from the street and feed the mixers or hoppers, or elevating buckets are used to feed the machines. By this method the concrete is placed through pipes or chutes directly into the forms. Such a plant should be well designed if a large output is to be obtained from it.

For smaller sewers the mixer can be placed alongside of the trench with the discharge end over the sewer and chutes used to place the concrete. A new method has lately come into use. Instead of moving the mixers continually, a portable, collapsible concrete hoisting tower is placed along side of the mixer and the concrete elevated, to chute it a much greater distance.

If these various matters are left to be decided as the various stages of the work must be done, then the plant instead of being one that is adapted to the job in hand, is more than likely to be a "crazy quilt" affair, with parts added as they are needed and no two working together.

The next step to be considered is the taking down and moving of the forms. Both time and money are frequently wasted in this work. However, if the proper system of forms has been adopted, this work is included, and it will be done at the minimum cost.

Consideration must be given to back filling. There are a number of economical methods of doing this part of the job, yet it is one part of the work in which money is frequently wasted, and it is often allowed to drag until the property owners along the street are exasperated by the piles of rubbish and dirt in front of their doors. This brings the contractor into bad repute, and as the city engineer is generally blamed in connection with the matter, he becomes provoked at the contractor.

The most common method is by hand, with short handled shovels. This is naturally an expensive method. With cableways and overhead trench machines the back filling is carried on as the excavation is made, making the cost of it very little, hardly enough to be considered. Other methods, where the dirt is piled on one side of the trench is to use some type of drag scrapers, the horses to operate them being kept on the free side of the trench. A rope across the trench or a chain attaches the team to the scraper. Another method is with a portable engine operating a similar scraper by power. This does its work very efficiently. When trenches are shored, then the sheet piling must be pulled out as the trench is being back filled.

The back filling gang cleans up the street as it works along, leaving it ready for the paving gang.

These are the various kinds of work that must be considered in starting such a job. When pipe is used instead of concrete, then for small pipes a few ropes will be needed for the pipe gangs, while for heavy pipes a tripod derrick across the trench should be provided. The same method can be followed in laying water pipes.

When bricks are used in connection with concrete or by themselves, then methods of serving the brick to the bricklayers in the trench must be considered and the proper tools provided.

These various classes of work, in starting follow one another in quick sequence and afterwards should be done simultaneously. Then the job will be carried on economically.

Starting Canal Construction.

Although different classes of machines are sometimes used in excavating canals, than for railroads, such as cableways, dredges and other types, yet the general work is somewhat similar so that the ideas set forth for railroads can be made applicable for canals. The locks and dams can be treated in the same manner as concrete bridges on a railroad. Thus it should not be necessary to go into details for canal construction.

Starting an Aqueduct Job.

The building of long aqueducts for carrying water to cities is becoming quite common in the United States and Canada. With the cut and cover method the work should be planned in a manner similar to that set forth under the head of railroads and sewers. Aqueducts more nearly approach sewer work in construction than any other class.

Other classes of work, such as tunnels, piers, docks, concrete structures and others could be discussed, but enough has been given to act as a guide for almost any kind of an engineering job.

CHAPTER VI.

HANDLING AND TRAINING MEN.

THE contracting game is played with men, machinery and capital; but the labor side, that dealing with men, is the most uncertain factor. It is a great problem and one that a contractor must face and solve. In some respects each contractor must decide matters for himself; but the results he obtains will be influenced to some extent by the acts and decisions of other contractors over the entire country, and more especially those in his immediate locality. In other words there should be some co-operation and the dissemination of certain principles and ideas that will be of assistance to all. Then too, whenever possible, regulations should be set that can be followed, for this problem of labor is a national one, and affects every community.

It is not possible to cover in so short a discussion the many phases of so important a factor in contracting as labor. It is the great factor of cost that is difficult to estimate.

The Labor Problem.

This problem enters into every phase of life. It must be considered by the workman and employer alike. It affects every man, woman and child. All must labor, and all must solve this ever-present problem. The contractor, who is an employer, must face this problem, he must solve it, he cannot shirk it, the measure of his success will, to some extent, be based upon how he solves this problem. Others can help him, guide him and point out the errors of others, their successes and failures, but each employer must make the final solution for himself. The author trusts that this chapter may be an assistance.

The Human Factor.

Employers who have handled a large number of men for some years know that the human factor predominates in working

men. A contractor cannot say, "I am indifferent as to the labor market, for I am using labor saving machines that make me independent." Such a man does not believe his own statement. He may have reduced his labor problem to the minimum, but machines need intelligent men to operate them, and many machines on construction jobs are idle at times because of the lack of such men.

The human factor in handling men, that is, the individuality of each man, must be considered. There has been an attempt to do away with this, even by workmen themselves, through the labor unions, but even they have failed. A man is a man and must be treated as such. Men cannot be made into machines, and a system that attempts to do so may run smoothly for awhile, but in the end it will be a failure. The successful organization considers the individual and uses him to make a great working unit to accomplish the objects planned by the man at the head of it. The individual is in the world to work.

"Remember that labor is one of the conditions of our existence." So wrote a great southern philanthropist for his own guidance in early life. This man, an untiring worker, believed in labor, he got his own enjoyment from his labors by his own high ideals.

The Dignity of Labor.

Toil performed with proper motive possesses dignity. There is a demand for service on the part of all. Every man's work is born with him. Daily duty, even in the lowest walks of life, if it is performed in the proper spirit and with a desire to serve others and promote the general good, becomes elevated to a high plane. Its richest gain is not merely world success (although one must in justice to himself and to those depending on the worker keep the reward of labor in mind), but the habit of application, discipline of thought, strengthening of will power, capacity for better work, independence of mind and general uplifting of character. Work animated by a high noble spirit is ideal.

Ambition is to be lauded, for a man of low ideals means a poor workman. On the other hand care must be exercised lest our ideal influence us to look for large opportunities only. Little things well done are better than great things of which we only dream.

The world owes no man a living, but every man owes work to

the world, and has certain tasks set aside for him to make the world better for his existence and labors. The great American poet has aptly expressed the sentiment:

"Let us now be up and doing,
With a heart for any fate,
Still achieving, still pursuing;
Learn to labor and to wait."

To learn to labor and to wait means infinite patience, and infinite patience and labor means genius. Laborers are divided into many classes, and in all classes men of genius are found. Two great divisions are made of the laborers of the world, known as the capitalists and the laboring class. Capitalists are laborers as truly as is the man who uses a pick and shovel, but their labors are of a different kind, and as they employ other men to labor for them, they are termed employers, and are usually placed in a class supposed to be antagonistic to the laboring class.

Classes of Laborers.

As stated capitalists are laborers, but excluding them from the list, we still have a number of classes and grades. The bosses are those who are employed by others in responsible charge of men and work. These are supposed to be in sympathy with the capitalistic class, as is also that great class of men employed at some form of clerical work. Then come the skilled laborers, the artisans and mechanics; then those who are trained in a special line without being skilled, making up the class of organized workers, and last of all that great class of unskilled laborers, the common laborers, who until recent years were considered beneath being organized. Today, however, they have been brought into unions in large numbers. We have the upper classes and the laborers (both organized and unorganized) divided into two distinct classes, the capitalists and the bosses, and the laborers and the masses. Centuries ago the masses were treated with little consideration; they were called dogs and churls, and were given similar treatment. Years ago Wat Tyler, in England, led the first great rebellion of the masses against the bosses and a new era was inaugurated by the men who shed their

blood in this cause. The improvement has been slow and gradual and for that reason has been more beneficial of results.

The Present Condition.

During all these years there has been many a bitter fight between the two classes. The French revolution was such a conflict, one of the darkest pages in the history of the world. The workman has lost in these contests as to temporary results, but each conflict has been a gain for him, and today the power, save that of the control of money, is entirely in his hands, and the workmen of the world and the masses are beginning to realize it. The fight is still on for the control of the world's possession, for the political and social power, and slowly but surely it is going into the hands of the masses. The great conflict in the last hundred years has been in North America and the results obtained there have affected the entire world. Even in down-trodden China, the masses have come into their own.

Many of the leading thinkers of both classes are beginning to realize that there is no such thing as capital versus labor; that the two are bound together by the same common ties, by the same desires and needs, that each is dependent upon the other and that the cry should be "Capital and Labor, One and Inseparable."

The principal things needed by the capitalists are also needed and desired by the masses. Good houses, good schools, good transportation and good recreation facilities, education that fits men for their work in life, well governed cities and countries, and justice and security for life, rights and property. These are all desired by the masses, and these are the things needed by the business men of any country.

These are the things that the laboring classes are demanding. Their cry for more wages is for better houses, better living, better recreation and more of it, better education, and the rights accorded to the wealthier classes, and the safeguarding of these rights and their property.

The Remedy.

If these things are obtained only through strife and strikes the capitalists will suffer, for the masses will soon be making their own laws. The remedy is for the employers to be the leaders of the

masses. Their opportunity is now. By enlightened leadership the masses can be taught that both classes want these same things, and through co-operation they will then be obtained for both employers and employees.

How is this leadership to be obtained? The answer is, "Labor Unions." It is idle to fight unions to put them out of existence. Labor unions have come to stay. They cannot be put out of business, for if this was attempted they might come only in some worse form. The question is whether it is to be a good union or a bad union. Many employers are deluding themselves with the hope that the labor unions can be gotten rid of, and the men dealt with as individuals. That day is past.

It is now a question of the employers' controlling and influencing the unions. It is their duty to do this. It means to help themselves and the workmen. The call for this has really become a duty for the employers.

Contractors who are large employers are just beginning to feel the effect of labor unions. They should profit by the experience of the manufacturers of the country, who have fought the labor unions at every step, gradually losing ground until the unions now almost control their business, and on short notice can tie up almost any branch of the manufacturing business throughout the entire country, in a few days.

In place of this, contractors could organize their own forces and join their interests with their men. Thus they could control the unions, not for their own selfish interests but for the common interests and benefit of their workmen and themselves.

The professional labor agitator and false leaders have with high sounding demagogic doctrine taught the masses many half truths and false and injurious tenets. The employers must combat such teachings.

This opens up the question of labor unions and wages, both of which have been dealt with in Volume I, pages 163 to 175.

The Open Shop.

One great right that unions are in accord upon is the closed shop as opposed to the open shop, contended for by employers. The union teaches that the workman shall have a perfect right to say that he will not work with non-union men, and that he will not

allow such a man, who may be willing to work for less money than the members of the union, to set the scale of wages to be paid all workers.

Furthermore he will not endanger his life, and the support of his family, by the untrained man, the non-union workman, working alongside of him, and through his clumsiness causing injury to him. To prevent these things and safeguard its own members the unions demand the closed shop.

It must be conceded that the workman individually and collectively as a union has the right to demand these things and conceding them to him, then he must concede the same rights to others. The individual workman has the same right not to be a union member, unless he desires to be. He should be conceded the same right to accept employment where he wishes that is accorded to the union man. He should be guaranteed the wages he desires, as is the union member. He should be given the same protection against injury by a union man as the latter insists upon having. Grant him the privileges contended for by the union and union workmen themselves will be ruled out of employment.

Then there is the employer's side of this important question. He must be accorded the same rights that the union demands. If the unions are to say who he is to employ and set the wages to be paid, then they should guarantee him against loss through the work of their members. Lacking this guarantee the employer should be accorded the same privileges demanded by the unions, and again they rule themselves out of employment. The reasons advanced for the closed shop are not founded on economic laws; they may stand for a time, but they will finally go, and workmen are bringing an injury upon themselves by insisting on this principle.

It is incumbent upon employers to combat these teachings in the proper manner, not by strife but by influencing the men in the proper way, by educating them and eliminating the cause of the trouble, that is, by an equitable scale of wages, by protecting all machinery, by providing for all men and their families when workmen are injured or killed, operating plants for reasonable hours only, and sharing with the workmen some of the extra profits made through their efforts. Concede these things and the need for workmen to demand the closed shop will be eliminated.

Labor unions must also be taught that many responsibilities likewise rest upon them, as well as upon their employers. If con-

tracts and agreements are to be made they must not be onesided. Both parties to them must be made to live up to their agreements. This many unions are not doing. They demand that certain wage scales be set, and certain hours for work be decided upon, and the employers must live up to these things, while the workmen, with only short notice demand less hours of work and increased pay. Even when a term of years is named for a certain wage scale, the employers have no guarantee that the union will live up to their agreement. The employer is responsible, he has capital and property and can be sued and made to live up to his contracts, while the union is without capital or property, it can be dissolved over night and if the leaders become at all dissatisfied they can revoke contracts, and not even be held for contempt of court.* There seems to be no way to hold them.

All of this could be overcome, the unions strengthened and be made so that a few agitators could not control them, by having each union incorporated with a capital stock. This capital could be easily raised by a small subscription among its membership and unions would then be in a position to be sued and to sue. Employers would feel they were dealing with responsible parties and wage agreements would be made quicker and hold under the law.

These are some fundamental principles of labor and the handling of laboring men, but conditions with contractors are slightly different and to understand them, we must go back and consider these things in a somewhat personal light.

Contractors and Their Workmen.

A pistol shot rang out on the night air, followed quickly by a series of other shots. Immediately every man in the contractor's camp was out of bed, putting on a few articles of clothing and rushing to the shack from which came the fusillade. The contractor and his superintendent, who were among the first to arrive, each heavily armed, found that a gambling game had been going on among some of the men until long after midnight, and with a plentiful supply of whisky, a fight had occurred over one cent, until pistols were pulled, and a shot fired, which went wild, when the other man had emptied four chambers of his revolver into his erstwhile friend, killing him almost instantly.

*Since this was written the famous Danbury contempt of court case has been decided against the labor leaders.

All was excitement, a dozen different stories were told of the shooting affair, men got into altercations over it, and for at least an hour, while the dead workman's body was being cared for, and a peace officer notified, the camp was in wild disorder. When the officer arrived, many of the workmen disappeared into their shacks and order was once more restored.

The next morning, only about twenty of the hundred men in camp reported for work. Many had left during the night, others just at daybreak, while some had waited to get breakfast and gather together their few belongings. That day teams and machines stood idle, while the overhead charges were going on just the same, and the contractor was losing money, due to a drunken brawl over a cent. The next day a few of the old men came back and two or three gangs were started but it was a week before new men could be obtained from the cities, and the work carried on as usual. It was difficult to estimate the loss to the contractor, for this recital is of an incident that happened in a contractor's camp in Tennessee. Many contractors, old at the business, will recall a number of such occurrences in their own experiences.

Most people would say that there was no need, nor any valid reason for these men quitting their jobs because of this murder over a cent; but to understand it the men who work at ordinary laborers on construction jobs must be studied and known.

Naturally, different classes of men and different nationalities are employed in the various sections of the country. In the south we have negroes and the foreign peasant. In the west, the offcast of the larger cities—the ne'er-do-wells, the drunks, with a smattering of foreigners, negroes and the hobo laborer. In the central part of the country there is a large element of foreign laborers, many of the hobo type, and an important class of Irish workmen, and a large number of negroes. In the east the foreign laborers, especially Italian, predominate, with a few negroes, some city toughs, and some hobo laborers.

These are the men upon whom the contractor must rely for the great mass of his laborers. He must learn to know them and to control them. He may have success without entering deeply into the problem of caring for his men and managing and controlling them; but if he goes into this important matter with a view of solving it his success is bound to be quicker and greater

Any young man entering the profession of contracting if he

intends to stay in it and climb to the top, must realize that one of the greatest problems before him is the labor question. He cannot elude it by using machinery. This can only minimize his troubles. He must face the proposition squarely, study, learn to know it, and then bring the many complex conditions and phases of the question under his control. There are psychological as well as practical studies to be made.

These workmen can be divided into several classes, no matter what their nationality may be. All of them will feel, to a greater or less extent, that the world is against them, that there has been an unequal division of the world's goods, and that for these reasons the world owes them a living. All of them have as a class perverted ideas of honesty and fair dealing. Thus they only give up in labor what is absolutely necessary to hold their jobs, unless an appeal can be made to their better nature or it can be shown them that it is to their own interest to put forth their best efforts. Few of them hesitate to take more money than may be due them, and to take things that can be sold quickly to obtain extra spending money.

Nearly all of these men are suspicious of others, and they are exceedingly democratic, showing respect to those over them only from fear. Most of them are superstitious. They fear the law, except when under the influence of liquor, when the wildest of them fear neither man nor God.

There is one class that is industrious, more or less self-respecting, thrifty and trying to be honest, decent citizens. These are in the minority. A second class is indifferent to these things, but is easily led either into good ways or evil. These are in the majority. In the third class are the wild, reckless fellows who must be subdued to be controlled, but if handled properly can be made to work and behave themselves. Only the first class are held by home ties. The others are at home wherever they go.

Understanding some of these things it can be seen why most of the workmen will leave a job when a murder is committed. Many of them do not wish to meet the police officers. They have shady records of their own to hide, and do not want to appear in court even as witnesses. Others, who are not afraid for these reasons, do fear that they may be committed to jail as important witnesses, and as this interferes with their liberty they move on to avoid it. Others are superstitious and feel that it is a bad thing to stay

around where a crime has been committed. The large majority go because the others have decided to leave. Thus the camp is soon stripped of all save those who are thrifty and industrious and feel that a change only means to spend money and curtail their earnings.

Naturally these things are not altogether one-sided. Contractor's workmen have been driven to some of these things. As a class they have been mistreated in the past, and by some are still being used in the same way. Those who are to better these conditions in the future should know the history of the past.

Past Abuses of Workmen.

Men have been carried from cities to work on construction in the mountains, or far from the track of beaten travel, and have been compelled to live in dirty shacks, tents and camps vermin-infested, and where fleas were more numerous than ordinary flies, and the mess house would be black with them. Rough boards and filthy blankets were the only beds furnished them, and the food was unclean, poorly cooked, and of the cheapest quality, with no variety from day to day. The condition of the men in such camps can be likened to that of prisoners about a hundred years ago. Work and the bare necessities of life were the only things furnished them. The author remembers one camp that he was in for a short time as a laborer, that was so full of body lice that he was compelled to make a covering of bushes to keep his blanket in and sleep under. Not a tent or shack in the camp was fit to live in, except that occupied by the superintendent and the contractor. Such conditions are not only a hardship on the workmen, but there is no excuse for them. In most sections camps can be kept clean at little cost, and even on the arid plains it is possible to have clean tents for men and a sanitary camp.

A variety of clean, wholesome, well cooked food can now be furnished men for about the same money that poorly prepared meals can be set before them. Men, to do efficient work, must be fed well.

Men are carried to such camps under all kinds of alluring promises, only to be disappointed. This has not always been the fault of contractors, but rather of their employes and labor agents, who have either deceived the workmen intentionally or have been deceived themselves, transmitting the story they have been told to

the applicants for work. In the end this is an injury to the contractors. If it is to be expected that men are to be fair to their employers, the latter must in turn be fair to their employees.

Then, many contractors in the past have not been honest with their men in regard to their pay. The author recalls a case in question in his own experience. He had worked on the grade for a railroad contractor, and when leaving, he asked for his pay. From his daily wage of \$1.75 various fees and a board bill were deducted until there was left but 87½ cents per day, and then the half cent was taken by the contractor and a time slip made out for wages at 87 cents. When he asked where he could have this slip cashed, he was told the contractor's office was in a town more than a hundred miles away. Upon presenting this at the contractor's office a week later, he was informed that this time slip was not due for nearly a month, and refusal was even made to discount it, but it was stated that a certain dry goods firm in the town would handle it.

Upon presenting this slip at the dry goods store, the author was informed he could take it up in goods at a discount of 20 per cent. Knowing the clerk in the store the author asked for money. The clerk took the matter up with the proprietor of the store, and stated as a special favor they would discount the time slip for cash for 40 per cent. The clerk further stated that they seldom gave cash for these time slips, but when they did give cash in part, the slips were discounted at 50 per cent.

A large number of saloons set up along the line of the work discounted these time slips for 50 and 60 per cent of their face value, according to how drunk the men were who presented them. In taking these time slips for drinks, the saloonkeepers exacted a smaller discount, seldom more than 40 per cent. The author did not expect the contractor to pay the face value of the time slip, but he did expect to collect his money from his employer for not more than 20 per cent discount.

This transaction was a mild one compared to some the author has seen. Men have been given time slips, and when these were presented for payment, and they objected to the discounts, or a dispute has arisen over the amount due, the slips have been torn up by the contractor or his paymaster and the men have been told to collect their pay if they could, and upon protesting against this kind of treatment and making some threats, pistols have been

drawn by several of the office force and the men driven from the camp.

The author remembers one occasion when he was paymaster for a contractor, that a workman was killed, and he sent the few dollars that was due the man to the widow, and upon informing the contractor of his action, he was informed that the contractor thought he was a fool, for this was the first time that a man had been killed or died in his employ that he had ever owed money to, according to his system of bookkeeping. It seems a poor part to rob the relatives of a dead man of the few dollars he may have earned.

Outrageous profits have been charged men on goods sold in some contractors' commissaries. Meat, flour, coffee and other groceries have been sold at profits varying from 100 to 300 per cent. Overalls, shirts and underwear that cost less than 50 to 75 cents a garment have been sold at prices ranging from \$1.00 to \$2.00. Shoes costing from \$1.00 to \$1.50 have been sold for \$4.00 to \$5.00 and profit on bedding has been exorbitant. A long list of such abuses could be given from the author's personal knowledge.

Contractors selling goods in a commissary can afford to sell them at reasonable profits, for they are benefited in more than the money they make on the goods. The men are furnished with good food, they are properly clothed and shod, all helping to keep the men in good health and spirits so they can render efficient work. It is true that contractor's prices on goods must sometimes be high, for all contractors do not enjoy good credit, which is necessary for close prices, nor do all contractors know how to buy to obtain low prices on their purchases. Then at times hauling of supplies to camps is expensive, owing to long distances and poor roads. The author has known of a number of cases where it cost from 1 to 5 cents per pound to haul supplies, and such extra costs must be added to the invoice price of the goods. Believing in commissaries, the author knows they can be run so as to be profitable both to the contractor and his men, and without abuses.

Charge accounts have sometimes been kept on a petty ledger against men for commissary purchases, and articles that were never bought have been charged against them. On pay days there have been tricks practiced that have been little better than highway robbery. Some contractors have armed their office force and had their walking boss and foreman standing around with pick handles

in their hands and pistols in their pockets on the pretense of avoiding trouble. As the men came up to be paid they were given any sum of money that suited the contractor, at times all that was due the man, oftener less, sometimes not half. If a man protested a show of guns was made, or he was set on by several stalwart foremen and beaten, and if the man ran, pistols were fired in the air to spur on his flight. The show of arms and a few beatings generally made the men as docile as a flock of sheep. Where this brute force was not practiced, the most ignorant of the workmen have been cheated of part of their pay, the contractor depending upon them not discovering the fraud or else on the men who received their pay in full quieting the dissatisfied ones by stating that as they received their proper pay, these men must be mistaken.

The author once applied to a contractor's superintendent for a job as a laborer, and he was told he must go to a city more than a hundred miles away and make application for the job through a labor agent. That evening a bunch of men arrived from the agent and the next morning they were put to work. By noon a number of them had left and although a foreman stated to the author that he needed men, yet a job could not be gotten except by applying to the labor agent miles away.

Contractors make a great mistake when they allow others to make a profit off their men, and this is done frequently in a number of ways, giving chances for the men to be wronged.

Men have been employed, men capable of doing excellent work, only to be discharged, not that this would make money for the contractor, but that some one else might make money off the men, although at times the contractor or his superintendent have received some of the graft money.

This is one of the abuses of labor agents; not that all agents resort to such practices, but the system as practiced allows such things. A man placed on a job for one year nets the agent two dollars, while if ten men or more are sent to do one man's work, twenty dollars or more are earned in fees. A large construction job needs many laborers and teamsters. At times men of all kinds can be picked up in the cities by the carload. The rotation of jobs keeps the business of furnishing men brisk. The agent or his clerk pick men unfitted for the work, drunks or those who are half starved, or young inexperienced men, with only a fair percentage of good laborers, and sends them to the job. From each one a fee is

collected. Within a few days another consignment of men is sent to the job and the superintendent has the opportunity of discharging most of the first bunch. This arrangement continues indefinitely, the boss getting fifty cents of the fee, and the men being traded upon are thus treated like cattle.

The drunks and incompetents care little for this treatment. They know the game, that there is graft in it and that the boss and the agent and possibly others are dividing their fees between them, and in their chagrin at being so treated they curse and damn all those in authority, but are soon cowed and if transported back to the city their recollections are soon dulled in a debauch.

With the young man, the inexperienced, it is different. He wants to work, to learn, to make money, and still has ambition to make something of himself. The contractor obtaining this class of men for the first time can make something of them if he handles them properly. It may cost a little time and money to teach them to be useful, but the young learn quickly and in most cases these men will become assets to the contractor. Discharge them for inexperience, or allow them to be discharged for grafting purposes and it will be but a short time, the length depending upon the individual, before these men will be on the downward road, will become soured on the world and will soon take their place with the vast army of unemployed, possibly becoming in the end incompetent drunks. Some of these men became what they are from choice, others from association, because they are weak and easily led, are followers, while many are driven down and out and are forced into the lowest classes of unskilled laborers, the floating laborers, those that not even labor unions will protect. In many localities these form the majority of the men that a contractor must work.

This grafting through employing men cannot be done as easily when railroad fares have to be paid as when free transportation is furnished to the laborers. On railroad construction some contractors are furnished free transportation or at a greatly reduced rate under the regular fare, for their men, but even where contractors must pay fares, the railroad companies using large numbers of common laborers for maintenance and reconstruction carry men back and forth free, and as there is no one to prevent the grafting, much of this is done among the various companies' forces. So large is the army of men employed by the railroad companies,

that what is done in connection with them affects to a greater or less degree the work of contractors. We are not looking for remedies here, we are describing conditions, so that men can be handled to advantage under those that exist. But cut out this free handling of men and there will be one chance less for grafting on these laborers, making of them mental and physical incompetents.

At one time contractors paid labor agents for furnishing men to them, and a few still do so, but as contractors learned that a fee was also charged the men for getting them a job, they refused to pay a fee themselves, leaving the burden on the laborer. As the service performed by the agent is a mutual one, it is difficult to say who should pay him, but it seems hardly fair that the laborer should be the one to pay the fee, when it is possible that he may be discharged the first day. A contractor will work a man upon whom money has been advanced until he at least gets the money spent back in labor.

Many men coming to work on a job are not in a fit physical condition to perform labor. There is the rum soaked man, and the man who has been broke, unable to buy sufficient food, and those who have been eating cheap foods that do not give sufficient nourishment. These men should be fed carefully if they are to be made strong and fit for work within a few days. For them special foods should be selected. If a contractor is running his own mess tent or shack this can be done, but if another has the contract for feeding his men, then the contractor can have but little control over such matters. The boarding contractor will live up to his agreement only and special dishes do not come within his contract. There are honest, competent men in the boarding business, but the contractor seldom has a guarantee that his men are being fed with the best, most wholesome foods. The boarding contractor must make a living and he does it by feeding men at a profit. A contractor can certainly do it as well, and again prevent some one from making money off of the men he is working. If the contractor covers his expenses in boarding his men, and the men are well fed and cared for, a profit will accrue to the contractor in the extra work that his men will do. Few contractors would consider letting their horses be fed by contract, and the feeding of men is as important as that of horses.

With Italians and some other foreign labor, the entire management and care of laborers, except during the eight or ten hours

they are actually at work, is turned over to the padrone. The man thus becomes the padrone's and not the contractor's. Again the padrone makes his living off of the men. He furnishes men as a rule to a contractor, without any cost, in such numbers and at such times as the contractor may direct. The abuses in this system have been set forth on pages 103 to 106 of Volume I.

These are some of the things that make men floating laborers. The business of construction has a tendency to make men restless and anxious to make changes, but this is made much worse by the abuses that have driven men from one place to another, that have made them a floating uncertainty, irresponsible and in some cases drunkards.

Contractors have not been guiltless of furnishing liquor to their workmen. The author can remember when it was a fairly common practice to sell liquor in contractors' commissaries. Many contractors considered it as necessary to their business as the army canteen was to the army posts. Thus men were sold all kinds of drinks and many bad practices were the result. Fights and quarrels were common occurrences. After a rainy day men were seldom fit to work, owing to the debauch they had been on during the rainy period. Those that became drunk sometimes had most of their earnings charged away by their employers, while under the influence of the cheap whisky. Workmen robbed their drunken companions. All of these things caused railroad companies and other corporations having construction done to put a clause in their contracts preventing the sale of liquor in the camps or at or near the work.

Today such clauses are overlooked to the extent of allowing beer to be sold openly by padrones to the foreign laborers. This is not necessary, although some claim it is. The author has worked large numbers of Italians and other foreign laborers without selling liquor or beer to them and the men were satisfied and gave efficient work. The sale of beer to foreign laborers sometimes covers up the sale of stronger drink to foremen and other workmen. For these reasons the author advocates prohibiting the sale of all strong drinks in construction camps. The more deeply this matter is looked into the more evident it is that, for business reasons, alcoholic beverages should not be allowed on construction jobs. If this was so 10 or 20 years ago it is more necessary today, when machinery is used extensively, so that men can be killed through

the use of strong drinks, and expensive machines can be broken up, causing heavy money losses and delays.

Lawless Camps.

Many contractors have not kept order in their camps and along the line of the work. Construction jobs have fallen into ill-repute throughout the country by this. A camp or a job that gains a reputation for toughness is seriously injured, for many good workmen will not go there, and only the wild, reckless fellows can be counted on. Due to disorder in camps in the past, the board of water supply of New York City, in charge of building the new dams and aqueduct for the Catskill Mountain supply, has kept a large force of policemen along the line of the work. Their duty is two-fold, to protect the city property and to maintain order in the construction camps. In spite of this there have been a large number of daring robberies and some murders, which have lost nothing as to being the deeds of desperadoes, when chronicled in the New York City papers. An organized police force of this kind is an excellent thing if conducted efficiently, but even such a force cannot prevent disorder without the co-operation of contractors. The police force acts after trouble has occurred.

In every camp some responsible man should be appointed a constable or a deputy sheriff, his duties as such being limited to the construction forces. This man should be made the police officer of the camp. Rules and regulations should be made to govern the men in the camp.

One rule that should be strictly enforced should be that liquor in original packages cannot be brought into camp and the camp officer should take in charge all that is brought to be given back to the man when he is leaving camp. If a man comes to camp intoxicated he should be made to go to his shack and stay there until he is sober. If he will not do this, turn him over to the law officers, making a charge against him of disorderly conduct. These two rules alone will prevent much disorder and trouble. Another rule that should be enforced is that lights should be out in the camp at a given hour, unless the camp officer is satisfied that there is a good reason for the men to be up. Thus men cannot gamble and carouse to a late hour and be unfit for work in the morning.

On Saturday night this rule need not be enforced as the men can sleep late Sunday morning and have the day for rest.

Other rules will suggest themselves. Self-respecting men do not object to such rules and regulations, they rather favor them, as they know that the rowdy men will be held in check, if such rules are enforced. The author has run a large number of camps and has followed the practice as outlined here, and can say that, even with the most lawless men, good order has been maintained and many crimes prevented. The fact that his camps were not disorderly has attracted the better class of foremen and workmen to him, and he has held men on his jobs month after month, when other contractors were sending away for new men.

Talk to some of the men that go to make up the great army of floating common laborers, also to the higher grade of men employed on construction work, the mechanics and machine runners, the petty bosses and the clerks, and the same general complaint is made from one end of the country to the other.

"The grub is punk"; "The camp is filthy"; "The meals are rotten"; "The bunks are not fit for a decent man to sleep in." So on through a long list, and the pity of it is that in nine cases out of ten the complaints are just ones. This is still so of some contractors' camps and is nearly always the case with camps belonging to railroad companies. At one time the contractor was likely to have an insanitary camp, with poor food and beds; but this has changed. Contractors have learned that it pays to have a clean camp and furnish men with good meals; that men are attracted to such a camp, and stay there to work much longer, as they are satisfied. Then, too, many cities and states, and private corporations, in letting contracts, now have rigid provisions as to the location of camps, their drainage and waste disposal, water supply, and many other things that mean a decent camp.

With railroad companies, and corporations such as lumbering companies and others who employ large numbers of men, there is seldom a man in charge of their camps who has any special interest in the men. If he has the accounts to handle, he can make much money on the side, in defrauding the men, rather than the company. Even if graft does not creep into the transaction, indifference does as to the welfare of the men, with the result that the camps and beds become filthy and full of vermin, the food is unhealthy and unfit to eat and the men are herded together like

cattle. Today so large is the number of men thus employed by these companies that the conditions that may exist with them affect the labor market over a large area, sometimes over a number of different states. The author has seen the labor market in the east affected by labor conditions in the middle west as far as the Rockies. So it is difficult to tell how far-reaching any abuse or any good effect will be on the labor market. It is likewise a matter for conjecture as to the far-reaching effect of the various abuses that exist among men engaged on construction work.

The Liquor Evil.

The drink habit amongst these men is partly due to the abuses that have been heaped upon them and to the general conditions under which they work; but there are other influences that attract these men to the saloon and to drink. The effect of liquor drinking on contractors' employees is one that causes a large money loss annually to the contractors of America. For this reason contractors should understand it and should assist in rectifying this terrible abuse and waste of energy and money. In all of these things the author is not dealing with the moral or religious side of these questions, although much could be said from that viewpoint; but he is keeping on the practical side only, telling how these things affect the pockets of contractors. He has neither pet theories nor reforms to advocate, but rather wishes to point out how he and others have overcome some of these things, thus improving many conditions at nominally no cost and making the labor more efficient.

Nothing starts the craving in a man for drink as much as hunger, which is caused either by a lack of food or poorly prepared or spoiled meals. Couple this with other bad living conditions and men will go to the saloon to drown their troubles in drink. Hunger, though, is not the only cause for these men drinking. To many it is the fact that nobody cares a rap for them, that memories are forgotten in the bottle, and the saloon attracts men of the class in question by the fact that it is the leveller of all social distinctions. To the foreign laborer this is not so important, though he soon learns it; but to the American-born laborer and the negro the saloon furnishes what is lacking elsewhere in his life. In the saloon these men forget the artificial distinctions in their social position, and furthermore the saloon furnishes recreation and

play, the only social side of their lives and the opportunity for meeting women. Then, too, in the city the saloon is often the means of hearing of work and at times of obtaining jobs.

Few men like the liquor for the liquor's sake. The thirst for it is not there at first. The taste in most cases must be acquired. Finally, though, the desire comes and then the liquor is taken at any and all times, until the man becomes little better than an animal, for he would sell his soul for a few drinks; yet at times even such men can be rescued from themselves and be made to do honest work. The contractor cannot, however, be in the business of reforming drunkards.

Democracy reigns supreme in the ordinary saloon. Enter their doors and one must put himself on the level of the inmates of that saloon. If the saloon caters to the men of the lower classes, the newcomer must be as one of these, or he had better make a hasty exit. A man who would hardly dare approach you in your office, who never saw you before, will insist on your drinking with him, and raises a row if you refuse, exclaiming, "You think you are too good to drink with the likes of me. I'll show you I am as good a man as you are."

Even the workman without money does not want to leave the saloon, for the saloon caters to him with its warm rooms, bright lights, free lunch and the companionship of others. At short intervals some one treats him, and so he obtains his drink. With each successive drink the social atmosphere increases and the other pleasures of the saloon increase. The decorations and pictures in the saloon appeal to the sensual side of the man. He is unmarried or separated from his family and these are the things that draw him on towards the vortex that seems like pleasure to him, for he at least momentarily forgets his hardships and troubles.

The proprietor or his barkeeper seldom ejects a man. The workman has no money today, but his being there helps business by treats. If he is employed he can get credit, while if not, he may have money to spend within a few days, and a few drinks may make him spend it lavishly. The workman, too, will bring his friends to any saloon where he is treated well. The workman knows all of this and considers that the saloon to some extent is his; he has a sense of proprietorship about it that he does not even have about his bunk back in camp, or his place at the mess table.

In the city the friendly saloon is the place for all kind of tips

as to benefits and favors that may come to the workman. A stevedore boss on the wharf wants some more men; a new railroad contract has just been let and a thousand men will be needed. A job is to be had for the asking. Free bread or other things are to be handed to those applying. All this information is given without charge, and the job may even be obtained without paying a fee. A contractor's foreman may make it a practice to visit certain saloons in picking up new men. The fact is that the saloon is frequently carried on in a more businesslike manner, to make money and please its patrons, than many other lines of business, and better than many contractors conduct theirs. Generally speaking, as an institution it is one of the most highly developed in the country. Everything about it is done for effect, and to obtain the object of the saloon, to sell drinks. Even the free lunch furnished is calculated to make a desire for strong drink.

This is one of the powers that the contractor has to combat in employing and managing his men. In arranging his work he must consider the saloon. If he is operating in the far west, on the plains or in the undeveloped mountain ranges, many miles from towns, he still has the saloons, for saloonkeepers will come upon the line of work, putting up tents to run their business. They sell liquor at high prices, give away ox-tail soup (no matter from what part of the cow the bone comes, it is always ox-tail soup), discount time slips and make big money from the laborers. A number of drunks are nearly always found lying around these tents, sleeping off their spree, but the saloon man cares for them, and feeds them and gives them drinks until they can go to work again to earn more money for a debauch. By these men the saloonkeeper gets his chores done, and keeps in a supply of wood and water. The contractor's work is injured by these saloons, which really should not be licensed.

When a contractor obtains work near towns and cities he has to contend with the saloons already established. He not only has the various abuses already described, but the workmen during work hours "chip" together and buy a "growler," which is passed around until the beer is consumed. Thus time is wasted and the men are furnished with a drink that saps their strength before the day's work is over. These saloons entertain the contractor's foremen, not only for their own trade, but also for that of their men. Thus, foremen spend time in the saloons that should be devoted to their employer's interests. Thus the contractor is not only out the

time so wasted by the foremen, but the workmen are wasting both time and materials while the foremen are enjoying themselves in the saloons. This drinking by foremen during work hours is one of the most expensive forms of injury due to drink that contractors have to undergo, and it is one of the most difficult to stop. The foremen become very sharp about it and attempt to hide this drinking in various ways.

These saloons also barter in the workman's time. If time checks or due bills for work are issued by the contractor, the saloonkeepers will buy such evidence of indebtedness from the men at a large discount, or they will sell the men liquor for their time checks. This at times becomes a great source of revenue to the saloonkeeper. One of them once told the author that he had raised the price of his 25-cent half-pint whiskey to 35 cents and then he made the men pay 50 cents in time checks for such a bottle of whiskey. Thus he had a profit on this whiskey when he sold it to a regular customer, but he added an extra quarter, all profit, for waiting for his money. This shows that contractors should not hesitate in demanding a heavy discount in paying such labor checks or due bills in the hands of saloonkeepers. They can well afford to pay the discount, and by having to give up part of their gains, they are likely to charge more for their liquors, with the result that the men may not drink quite so much.

Some contractors refuse to cash time checks in the hands of saloonkeepers and tradesmen, as these slips and checks generally have printed on them the phrase "not transferable." They do wrong in this as these checks are considered as evidence of a debt created, and as the men are paid in them, they can trade on them. Thus the courts in many different states have decided that these checks or slips must be paid to the bearer upon being presented, when due, at the face value. Thus, if refusal is made to cash them, when first presented, the opportunity of making a discount on these slips may be lost. The better plan is not to refuse to pay them, but if possible to defer the payment, asking for a large discount, so as to make the man anxious for his money and make him agree to the discount rather than be compelled to start a lawsuit.

Even in the states where saloons are not licensed contractors have trouble regarding whiskey selling to their men. "Speak easy" places are started up to sell the men, and even peddlers come onto the work and sell liquor. These whiskey sellers give a bottle to

the foremen in order to be allowed to ply their trade. These men are lawbreakers, but in many cases contractors cannot deal with them as such, for the families and friends of these men might injure his property or interfere in other ways with his work. In out-of-the-way mountainous sections, peace officers have little power, while these whiskey sellers are desperate men. However, it is possible to prevent them from coming onto a man's job, if they are handled properly, and that is a help, although it does not prevent the men from going to them to purchase liquor. Even moonshiners in the southern mountains will run risks of being caught at their business by selling whiskey to men working for contractors.

These are the abuses that come to the workmen of contractors from the liquor habit, the greatest sapper of human energy under the sun.

The Roaming Habit.

Another awkward thing to contend with in handling such labor is the roaming habit, and the fact that jobs are frequently short. The roaming workman, or "hobo workman," as he prefers to call himself, has become so used to being on the move that he is at home everywhere. The hobo laborers must not be confused with the tramp, who is a hobo that does not and will not work; for the hobo laborer is willing to work and is often an efficient workman and mechanic, but like the tramp he has the wanderlust in his veins, and he must be roving, so he works only a short time to get a grub stake or some spree money, when he is gone. He, though, through vicissitudes sometimes becomes the tramp, the hobo of the road. The floating laborer will at times take up with tramps, but their companionship is short.

Thus these men, without family ties, are forever on the move. Some of them have learned this floating habit from the fact that their jobs are short, while others are of so little account that they cannot hold a job long, being discharged after a few days. The latter kind the contractor has little use for, as the never-do-wells are only a hindrance to him but the first can be made valuable men to some contractors, if they are handled properly.

Contractors sometimes make a mistake when they help men to form the habit of roaming, but this subject will be taken up later. Another error in handling men is to employ large numbers for a

few days only and then discharge them. The author knows of a building contractor who used to be in the habit of employing a large number of bricklayers, as soon as he got eight or ten carloads of brick, and when these were laid, in a few days, all but one or two men were let go. This was also the case with the helpers. This contractor quickly got into bad repute with laboring men, so that they would not work for him, if other opportunity offered itself. The proper and most efficient way, except in some special cases, is to employ such a force as to keep the work going expeditiously without running out of material.

It is just as wrong to ask for more men than are needed, or to send word broadcast that large numbers of men are wanted on a piece of work, when only a few are needed. If only 50 men are needed do not advertise for one hundred.

It is a safe rule to lay down, that if employers are considerate of the classes of men who labor for them, these same men, with but few exceptions, will be considerate of their employers. The interests of the two should be identical, but the employed must be willing to meet the laboring man at least half way; in fact, the advances must come from the employer, and it is to his interest to make them.

A remedy cannot be applied to anything until the case is diagnosed and thoroughly understood. If contractors are to improve on the method of handling their men, they must understand the troubles of the past, know both sides of the case and then the remedy to be applied for the future will be the proper one.

The Effects of Abusing Men.

This is a summary of the dozen or more evils that exist.

1. The deceiving of men when employing them is one evil that may have but little effect on a particular contractor or a special job, but in a general way it has a far reaching effect on the labor market and on the men themselves, and finally the harm comes back to the contractor.

If men are deceived as to the condition under which they may have to work and live, or as to their laboring hours or pay, they are not only dissatisfied, but they will do indifferent work and take the first opportunity of leaving the job that occurs, although they may go to work where conditions are worse; but they are satisfied,

for they have not been deceived as to the second job. The common laborer is not only suspicious, but he is also resentful, and he feels that in most cases employers are getting from him more than their just dues. Have men told the true conditions, the hours of work and the rates of pay and then see to it they get all that has been promised them.

Workmen are often deceived as to the length of a job. The deceit in this case may be intentional or unintentional, but the results are the same. A contractor who knows he needs men for a few days only or for any short period, and engages a body of men, or carries them a long distance to his job, without telling them of the probable length of service, works a hardship upon many of these men, and causes himself to be injured by helping to spread dissatisfaction among his regular forces, and making it more difficult to obtain laborers when he needs them. Men who are to be used to break a strike should be told so.

Unintentional deceit may be caused by newspaper reports and rumors about a job, so that the men may deceive themselves; but the reflection comes back upon the contractor and employer. Recently a prominent manufacturer announced a profit-sharing plan with his employes, and made a public statement that he would establish a minimum wage (setting a fairly high figure) in his plant, all coupled with the statement that there was no scarcity of work. This was published by nearly every newspaper in the country, so that a tide of unemployed swept towards his factory, until the city in which it was located was filled with thousands and thousands of unemployed, and the authorities had to take steps to stop the influx, and were taxed to the utmost to care for those already on their hands. This was an unintentional injury to the labor market, the bad effect of which will be far-reaching, and its influence will be felt for a long time. The author has seen the same thing occur in starting a new piece of construction of some magnitude, but even then the conditions of things were not affected as much as in the case just cited.

2. Labor agents often deceive men in sending them to jobs. Their interest ceases when the contractor takes charge of the men and their own fees are paid, but the contractor must bear the injury done. It is well to have some one advise the men of the conditions before leaving the labor agent's office.

Many other abuses caused by labor agents have already been

commented upon. The author believes in labor agents, and he knows there are good men in this business, and that some have been highly successful in furnishing contractors with a good class of workmen; but like any line of business there are men who, if permitted in it, should be controlled by the proper laws and inspection. There should not only be state and national regulation, but very rigid inspection. It is to be hoped that the present national commission just organized by an act of congress will be an aid in this matter. Any regulation and inspection will be opposed by the irresponsible and rascally agents, while those who are attempting to run their business on the proper principles will welcome it.

Inasmuch as so many abuses have been practiced by labor agents in some of the larger cities, especially in New York, some of the most prominent business men and social reformers have organized employment bureaus in order to have both employers and employees treated fairly. These agencies are not run for profit, but to do a fair business and to cover only actual expenses.

3. Insanitary and poorly-arranged camps are a great hardship to those who must live in them. The effect is that men give poor work to their employers and soon become dissatisfied and leave the camp. The arrangement of camps and keeping them in a sanitary condition has been dealt with in a chapter, in Volume I, so it is not necessary to go into that phase of the question here.

4. The author remembers working in a contractor's camp in the Rocky Mountains some years ago, where tough beef, boiled beans, bread and coffee were served three times a day. Once in a while boiled rice and raisins or some dried fruit were served with some sweetened dough as cake, and this was the fare week after week, except that about once a month a few bushels of onions were brought to the camp. Both Americans and Mexicans went wild over these and many of the onions were consumed raw, before there was an opportunity to serve them on the table. A canned sardine or a piece of cheese would have been considered a luxury in this camp. This is an example of a poor and limited variety of food, and the cook became so careless that it was with difficulty that most of the men at the tables ate their meals. No excuse could be offered for serving such meals, for other contractors on the job were feeding their men much better.

Men to do hard work must be furnished with plenty of good,

wholesome food, and it should be well prepared and served cleanly and nicely. Fancy foods are not necessary, but there should be some variety, and today there are only exceptional locations where it is not possible for contractors to obtain a fair variety of foods. The indifference shown in feeding men quickly reacts in men showing indifference in their work, and nothing drives men to the saloon quicker than poorly prepared and insufficient food. A contractor who may feed his horses well, may care little regarding how his men are fed. The author has had much experience in feeding men, and he has learned that 50 cents judiciously spent in pleasing men as to their meals, quickly returns a dollar in their work.

5. Disorder on construction work and in camps is an evil that means that any job will be disorganized and the men and foremen, instead of working together, will be interfering with one another, thus preventing others from doing good work. Discord will break up any system, and the contractor is the one to suffer and pay the cost. Thus it behooves him to see that drinking, fighting, gambling and other immoral influences are cut out entirely. Start a job right in this respect and it is very easy to carry it along in the same manner; but once let the tough element among the men gain an ascendancy and it will be difficult to stop them. Many contractors, besides losing money by allowing disorder on their jobs, have also lost their lives, being killed by some lawless laborer or foreman.

Men should never be allowed to have firearms in camp and it is even poor practice to have foremen swaggering around with pistols in their hip-pockets, drawing them on the workmen and placing themselves in such a position that they must either shoot or be known as pistol bluffers. If men are to have shot guns or rifles for hunting, they should be made to keep them in the contractors' office and be allowed to use them only when they have opportunity to hunt. The practice of raffling off pistols and guns to workmen in order to make large sums of money from the men is to be condemned, as it may lead to danger and it is not fair to rob the men of their money. This is mentioned because the writer has seen many pistols and guns sold in this manner, \$25 to \$50 being obtained for an article that was hardly worth \$5.

6. The evil of the drink habit and the saloon need only be mentioned for it has already been discussed at some length. A con-

tractor, though, who is an habitual or excessive drinker need only expect that most of his men will follow him in drinking. It is not necessary to have liquor on a job for personal use, under the guise of furnishing a drink to the engineer when he visits the work.

7. Commissaries are necessary on jobs outside of cities and towns. On such goods as are sold in these commissaries—and there should be such a variety as to furnish the many needs of the men and their families—a fair profit should be made by the contractor, a profit equal to that of any storekeeper; but the excessive prices charged not only are a hardship on the men, but also prevent them from buying many things that would be purchased if the prices were reasonable. Thus the contractor is likely to make less profit with the excessive prices than by selling a greater bulk of goods at reasonable prices.

8. Defrauding men in their time is an evil that injures not only the workman but also the contractor; for the money thus stolen is likely to be only a small part of that which must be spent to obtain others in their place. Men should be given the actual time they make, and whenever possible some system of time keeping and recording should be used that will allow the men to know the time they are credited with each day. Then disputes as to errors can be settled promptly while the matter is fresh in the minds of all those concerned.

In like manner charges made against the workmen for rent, goods purchased, and similar things should be so kept that the workmen know the amount as well as the contractor. Then and only then will the workmen know beforehand the amount of money they are to receive on pay day, and receiving that amount they will be satisfied.

9. The defrauding of the laborer of his hire on pay day is not practiced as it once was; but enough is still done in this line to make laborers very suspicious of some contractors. A contractor who makes a practice of robbing his men, or allowing them to be robbed in his name, need only expect that his men will rob him to get even. If they cannot do it in any other way, they will soldier on him at their work, and when they are tired of loafing for little pay, they will go off to work for some contractor who will pay them for the work they do.

10. An evil that contractors have to contend with is the

roaming habit of a large percentage of laborers. This is an evil in which contractors are perhaps more sinned against than sinning, for they themselves must roam a great deal to keep themselves in work, and thus their laborers form the same habit. But contractors allow foremen to discharge men too quickly in many cases. A man discharged on construction work must move on. Discharged again, there is another move; so that in this way men who could be made to earn money for a contractor are turned into roamers, and the habit may become so fixed with them that they become tramps.

A man should be discharged for insubordination as an example, and in order that a foreman's orders should be obeyed and respected; but the indiscriminate discharging of men is wrong. A man shoveling may not be able to keep up with his mates, yet he may be an excellent man with a pick or on the dump. Or a man in a concrete gang may not be good with a barrow, but may do efficient work on the forms. Foremen forget their own functions when they do not use their heads to secure work from men, and only discharge them when they are not able to keep up or do not do the work in a satisfactory manner. Men are frequently more difficult to obtain than foremen, yet they are run away from some jobs by the last named as though they could be obtained from the surrounding bushes. Men must often be taught the proper motions of certain work, and if once shown will hold up their end. Others must be spurred on by encouragement and others made to understand that they must put forth their best efforts. Foremen are to make men work and not discharge them.

11. Many contractors show an entire lack of interest in their men. Said one contractor carrying on large operations, "I never know a workman on any of my jobs and I never want to know them."

A contractor operating in the South frequently said, "Kill a mule, buy another; kill a nigger, hire another."

It is such men as this that bring injury to any business. They are willing to take out of the business all they can get, but it never occurs to them that they owe something to their business and their employees.

Every employer, no matter in what line of business he is engaged, should show some interest in his employees, who are assisting him in making a living. This does not mean that he must become intimate or familiar with them, but each man should be

treated with some consideration and as though he was an individual who was worth having.

No employer should so hold himself above his men that any workman cannot see him if occasion warrants it.

12. It is a wrong principle to allow others to make a living off a contractor's workmen. In the west it is a common practice to allow a boarding contractor to make a living out of boarding contractors' workmen. In the east padrones become rich in furnishing men, and either boarding them or furnishing them with supplies. In some cities labor agents are allowed to prey upon laborers. In other localities storekeepers get contracts for furnishing men with supplies, only to charge them exorbitant prices.

The contractor himself should control these things, for not only will the men be treated better, but he himself will add to his profits.

In handling men on construction work it is not possible to give exact rules and regulations that can be followed in every case, for men themselves, both those to be managed and those doing the managing, are strikingly different, and the conditions under which men must be worked vary greatly; but some general principles can be laid down and advice given that can be applied by discerning contractors and managers.

Employing Workmen.

First is the employment of men. Laborers cannot be employed with the same care and scrutiny that should be used with foremen, clerks, bookkeepers and mechanics, but some discretion should be exercised. It is a poor way, generally bringing bad results, to allow foremen to hire the men. Few foremen seem to have much judgment in selecting men, and it is not within the province of foremen who have to work the men to hire them. This sometimes leads to serious abuses. The author knows of one man who allows a stable foreman to hire all teamsters. This boss soon found that he could make money by charging the men a fee for giving them a job. Thus the engaging of men became so profitable that many of them were discharged so that the foreman could hire new ones, making more money. Then men began to pay him to hold their jobs until the system of monthly payments was developed. It is evident that this contractor does not really control his work, al-

though he may think he does. This teaming is controlled by this foreman, who is grafting on the men, but the cost of all this is coming from the contractor. Many similar cases could be mentioned from the author's own knowledge. The easiest way to prevent such grafting is to cut off such power from foremen.

If the contractor is carrying on small operations, he should employ his own men; but few contractors can do this, so it is well to have one man on each job to do the hiring of men for the construction work. In most cases this man will be the general manager or superintendent, but on some large jobs he, too, may be too busy to give time to this important detail. Then another man must be selected. The man who is allowed to do it must not be taken up with his own importance, which is a common failing of too many men who are given some authority that can be exercised before the public. This kind of a man is as apt to employ the worst men applying as he is the best, for he will be attempting to impress the men, instead of forming a fair estimate of their ability.

It is a difficult matter to judge a man for both physical and mental labor. For a common laborer, at the usual wages paid, it is not expected to obtain a man of great mental ability, nor is it always a requisite; yet the greater the intelligence, up to a certain point, the quicker the man is likely to learn and the better his work will be. However, a man of great mental ability, even if he has the necessary physical strength, is not likely to do monotonous physical work as well as a man of less intelligence. The thinking man will soon become dissatisfied, for instead of having his mind on his work, he is apt to be thinking of other things and planning for himself. A strong man of fair intelligence makes the best manual worker. These remarks do not apply to mechanics.

To get physical endurance does not mean to select large men. They are frequently strong and able to put forth great exertion for a short time, but the man for endurance is the average sized man of stocky build. He is apt to be quicker in his movements than the large, heavy man, will size up easier with other workmen and can keep up a regular pace much longer. The stout man is often very strong and answers for many different kinds of work, but he is not suited for all kinds of laboring. The undersized man is to be preferred to the large man as a general thing.

The short man has many advantages in stooping over and working close to the ground over the large man. The man with

broad shoulders and well developed arms and with a tapering body is well suited for such work as picking, using an ax, a striking hammer or maul. The stout, heavy man is suited for work with a bar, dumping carts and scrapers, tilting mixers and other work where weight and great strength are needed for a short time. The man with a muscular back, broad hips and stout legs is suited for heavy work that needs endurance. These and other physical characteristics should be studied in selecting and hiring men.

Under many circumstances nearly all men applying for work will be hired; then the selecting of men for different kinds of work will depend upon their physical appearance, and this should be a guide even after the men become known from weeks and months of work. It is only too common to see men placed at work for which they are not suited physically.

It is not as easy to select men for intelligence as it is for physical ability, yet every employer should attempt to get laborers of fair mental ability, although the man of low intelligence can also be made to do efficient work if intelligently handled and guided.

The man with eyes set far apart, with heavy jaws and a stout short neck, inclined to give his head a drooped appearance, is generally of low mental calibre. The man with eyes far apart, long thin neck and short pointed features possesses more intelligence than the other and is generally easily led and managed. He is seldom sure of himself but can be encouraged to do any physical work under a competent foreman. The man with deep set eyes, with angular features, is one that is sure of himself and his ability. He takes himself and his work seriously, is difficult to manage, for he feels he does not need a boss, but if handled right can be worked as desired and led to improve on his fellow workmen's methods.

The man with the close set piercing eyes and strong facial features possesses more than the average intelligence. He should make the best and most intelligent workman, but his mental ability often makes him the shirker, the "slick" one, who gains the good will of his incompetent fellow workmen by helping them to beat the boss. He is the man who, in spite of his intelligence, must be driven and kept so busy that he cannot get himself into mischief.

The great mass of the common laborers possess little in their faces to show their mental ability, so that such men can only be known by working them.

All these and many other things are considerations in hiring

men, especially when selections can be made from a number of applicants.

When men apply for work there are a number of things they should be told promptly. First, the wages paid and the hours of work. Also when pay days occur, and for what period of time they receive their money on each pay day. For city work this about covers the conditions; but for work on jobs in the country, where men must board or live in camps, then more should be told them, such as the price of board, or how they can get their supplies, the charge for bedding and for fuel, if one is made. The cost for doctor's attendance and hospital service should all be explained. Machine runners and mechanics should be told the rules and regulations governing their work, the care that is to be taken of the machines, and the periods of cleaning and overhauling them.

The easiest method of doing this is to have these various regulations printed in a small pamphlet and, when employing men, to allow them to read it. Men who cannot read will find some one who will read to them. The applicant, if he is not satisfied, can refuse employment, but if he accepts a job, he agrees to abide by the regulations. This prevents a lot of trouble and to some extent makes a contract between the employer and his employees. If a contractor's work is limited, the regulations can be written on a typewriter and a number of carbon copies made. A half dozen copies will last a long time, as they are kept in the office, the men returning them after reading.

In employing other than common laborers—foremen, mechanics, machine runners and clerks—it is necessary to ask questions in order to learn what experience these men have had in the different lines of work. This only serves as a part guide, for many of these men become very expert in telling of what they can do and have done, appropriating to themselves the experience of others upon the jobs on which they may have been employed. Many of them show letters of reference, stating they were employed by different contractors. These letters are of little value. Naturally letters of reference are not given to men who have been discharged in a fit of anger by their employers, or for breaking up machinery by ignorance and carelessness. Nevertheless many men are put off because of poor ability or are gladly let out at the end of a job, who could not find employment again from the same contractor except in a pinch, yet letters are given them stating that they were

employed and possibly recommending them to others. This is done to get rid of the men without offending them. This fact makes the value of all letters of reference or recommendation held by such men questionable.

A contractor carrying on small operations cannot afford to hold men even on half pay from one job to another, or from season to season, but a contractor running a large number of jobs, amounting to a large sum in the aggregate, will find temporary employment for his best men during the off seasons or between jobs, or will carry his men on full or half pay. To others, whom he cannot afford to take care of in this manner, he will promise re-employment as soon as he can use them. Thus his good men are cared for during slack periods and few of them are looking for jobs. Even if he lets them go without promises, he is glad to hire the capable men again as soon as he can use them. Indeed, a contractor carrying on large operations considers the men of ability in his organization or those formerly in his employ, whose addresses he endeavors to keep, as one of his assets. One trouble a man starting into contracting has is to obtain and hold competent men. He is not able to pay large salaries and the best men in the business have jobs and can be induced to leave their present employers only by offers of larger salaries and regular work.

Thus a contractor looking for such men can question applicants and pick out those he thinks may be competent, but the only way to be certain of their ability is to try them. A discharged man may have learned a lesson from his discharge, and thus become a valuable employee.

The foregoing remarks have been based upon the assumption that men are plentiful and a contractor is receiving many applications from men, so that he can exercise some choice; but at times workmen of all classes are scarce and the contractor is compelled to employ anyone that he can get. Then he must work them, good or indifferent, until he can obtain a better class of help.

Using Labor Agents.

In many cases men are so scarce that the contractor must rely almost entirely upon labor agents to obtain most of his help. The mechanic and various kinds of union men can sometimes be obtained through the labor unions, but even these in some places may

have to be obtained through labor agents. It must be remembered that labor agents pay a license to do their business and sometimes, where they send men from one state to another, they must pay a large fee as an immigrant agent, so that these agents must make money through supplying men. They have office rent to pay, and must hire sub-agents to furnish men from congested labor markets or centers, likewise runners to collect men and deliver them on jobs. They must sometimes furnish men with lodging and food. They also have to advertise to obtain men, and likewise to place men with employers. Thus labor agents are under heavy expenses, and they must do a large business to make a living. Like the dealers in horses, they must place the poor ones as well as the good ones, for all is grist that comes to their mill.

A contractor makes a mistake in simply ordering a lot of men from a labor agent. He will obtain in this way an indifferent lot, many of whom will be worthless from the start. Others, who may be competent, may feel disappointed in the conditions surrounding the work, or feel that they have been deceived by the agent. They accordingly leave the work and carry many others with them. No matter what results the contractor obtains from the new workmen, the labor agent has done his part and earned his fee.

With a padrone furnishing men, conditions are slightly different. The padrone has to look after the housing of the men, their board and supplies. He, too, must suffer if the men are dissatisfied, but even with the padrone worthless men may be procured.

No matter how the men are obtained, either direct from a labor agent or through a padrone, it is well, if any number of men are to be hired, to send a responsible man to see the new men before they start for the work, unless the job is in the same city as the labor agent's office. The rules and regulations as to pay, hours of work, boarding and many other matters of vital interest to the men, previously mentioned, can be told to laborers before they leave the charge of the labor agent. Photographs of the camp and work can be shown and many other things done to win the confidence of the applicants. Then the men can hardly be deceived and the party of men after reaching the work are likely to stick, with the possible exception of one or two. A shrewd man in looking over those applying for work will exclude some that are likely to prove worthless and will likewise reject any "sea lawyers," who are more than apt to make trouble.

The labor agent may object to some of these things being done, but if he is handled in a courteous manner, and given to understand that the contractor will give him more business if he can obtain satisfactory men, his objections will be withdrawn. The chance of the contractor's own agent grafting on the men with the labor agents, who care little for their own reputation, is considerable. For this and other reasons already mentioned the contractor should send only a responsible man on such a journey, one whom he can trust.

Contractors cannot actually control labor agents, but they can be careful in selecting agents to deal with, and can assist in the movement to have National and state supervision of labor agents. The author advocates that a smaller license or fee be charged labor agents, allowing more men to enter the business, and that there be closer supervision of the agents by the state when their business is confined to a single state, and by the national government for interstate business. The employment of the vast army of floating laborers is a pressing matter in America, that is, in both the United States and Canada, and the question can be given an economical solution only when the abuses are eradicated. Some of these abuses are due to labor agents, who have much to do with these men and must be controlled. The cheap lodging houses in our towns and cities likewise need closer supervision, as these become the temporary homes of this class of men, either when out of employment, or when employed in the cities.

Decent Camps.

Men employed in the country must be furnished places to live, and this is done on construction work in camps. The need of good camps has already been pointed out, and the reader is referred to Chapter VII of Volume I for further information. The sanitation of camps and the arrangement of buildings and conveniences have been dwelt on, but a camp that does not include in it some elements of home life will not be attractive to men. A contractor's camp is his home and that of his employees and it should be looked upon and treated as such.

Feeding Men.

Where men must be fed in camps, the proper provision must be made for it. A good kitchen with modern conveniences should

be provided, and dining rooms that can easily be kept clean and that have plenty of light should be built. Provision must be made for properly heating the dining room. Whenever possible, each man should be assigned to a place at the tables, as a man feels better satisfied when he eats at his "own place." If white table oilcloth is used on the eating tables, then the kitchen flunkies must keep them clean, for the least dirt will show. The tableware need not be china, but white enamelware kept clean, with steel knives and forks and good sized cups and saucers of the same ware, can be made appetizing looking as well as serviceable.

The food should be of good quality and of as great a variety as the season and market will afford. The variety is almost as important as the quality, for men soon tire of the same diet. A change of meats and vegetables means that men will eat more unless the changes are made frequently, when the additional amount consumed due to a change will be very slight. However, it is this increased consumption and the change in diet that not only keep men satisfied but also enable them to feel "fit" for their work. Some men want a change in bread, but most are satisfied with good white bread, with some kind of warm bread for breakfast. Pastry and good desserts give a pleasing touch to a meal, and most men like such things. A good pastry cook will more than earn his wages where a large number of men are fed.

The cooks must be made to keep the kitchen clean as well as themselves. White aprons and coats not only look well but show dirt so they can be changed at once when soiled. Smoking in preparing meals should never be allowed. If exact records are kept of the number of meals furnished and of the food used, it is an easy matter after some months, to feed men satisfactorily and yet make the kitchen pay its own way, and at times a profit can be netted. The first consideration is to give the men good meals, as their work depends upon their food.

Order in Camp.

To attract and hold good workmen on a job there must be law and order in a camp. The police powers of the state can be invoked in such matters, but this will not prevent disorder, only handle the matter when it occurs. Mention has already been made of

having a deputy sheriff or marshal in the camp. The preventive is with the contractor. Have a reliable watchman who acts as the police officer of the camp, and give him rules and regulations to enforce. Expel liquor and firearms from the camp as previously explained. Make men who are in camp put lights out and go to bed at a reasonable hour. Do not allow heavy gambling to go on, and never allow foremen and others in charge of laborers to gamble with them. This not only may lead to disputes, and bad feeling but if men become indebted to a foreman or a foreman to them, one has a hold on the other, to the detriment of the contractor.

If men get to fighting they should be stopped at once, and if bad feeling is aroused, the man at fault should be driven from the camp, so that others will learn from this example, and murders may be prevented. It is better to lose one or two workmen than to have a shooting affair in the camp and have most of the men leave. Bad blood engendered between men of this type is not easily put down and the only safe plan is to separate the men. This is especially so with Mexicans, Italians and other southern bred nationalities. Some men travel in gangs or small cliques, so when trouble occurs with one of these, all of the clique will get into it, but it is better to let the entire crowd go rather than have trouble.

Care must be exercised that trouble does not occur between foremen and laborers or machine runners and foremen or laborers. Men frequently get into trouble in camps over women and this leads to injuries being inflicted either on the contractors or on his machinery. If trouble occurs between a foreman and laborers and the foreman is at fault, he should be discharged, but to maintain authority and a good organization men must be made to understand that they must not nourish grievances against foremen, and if they do, they should be discharged.

A foreman who carries a gun strapped to his hip is one that should not be engaged, for such a man is only looking for trouble and when it comes it gives his employer trouble and extra expenses. A superintendent or general manager and a watchman need, upon many occasions, to go armed, but only these should be allowed to carry guns, and if necessary a permit from the state should be procured for these men.

Sometimes foremen and laborers have used dynamite to blow up those who have offended them. Dynamite has been placed in boilers, and pieces of steel in the gears of machines to get even with

a machine runner or a foreman. By such dastardly tricks, not only have the desired men been killed, but innocent workmen and bystanders injured and killed, besides the contractor's property destroyed. Machines have been laid up for days waiting for new parts to arrive, so as to start the work again. This shows the necessity of preventing these things and keeping supplies of explosives so that men cannot get them, and having them accounted for, so that if any are stolen, the fact will be known at once, and a special watch be maintained to prevent them from being used for mischief.

If a contractor will make it evident that he will not allow drinking and carousing to go on in his camps and on his work, he will gain the support of the best men in his employ to help prevent disorder and lawless acts.

The Drinking Evil.

If men are to be kept from the saloon and the bad effect of liquor and be kept in camp without fights and brawls, then they must be furnished healthy amusements and chances for recreation. This subject has been partially covered in Volume I on page 108, but more should be written upon it for the matter is one that is a decided help to contractors in holding and working men.

It has already been explained how the saloon attracts a man, how he is made to feel at home in it, how it provides a club room and associates to the man who is down and out. If he is to be kept from this he must be provided with something to take its place. The cost need not be great, depending on the size and length of the job, but a club room can and should be given to the men. It can be built to conform to the other buildings in the camp. If they are rough board shacks, a large one can be built as a club room. If more substantial buildings than this are being used, then the club building can be better than a rough shack. Tables, chairs and plenty of light should be furnished for it. A rack should be provided for books and papers, and to hold the various games that are not being used. This room should be turned over to the men to use as they see fit, so long as property is not destroyed and order is kept. Smoking and talking should be allowed. If possible it is a good idea to have a small room for reading, in which talking except in whispers is not allowed. It is not

an expensive or difficult matter to furnish men with reading. Papers that the contractor or his superintendent take can be turned over to the men, after they are used. Trade catalogues will interest these men, in fact any books or papers that have a lot of pictures in them.

The atmosphere of unrestraint that surrounds a saloon must be around this club room or building. It should be turned over to the men for any kind of entertainments that they wish to have, and the contractor should assist somewhat in getting up such things to interest the men. Talks from manufacturing agents and other experts on the care and handling of machinery and the use of explosives and similar subjects will be welcomed by the men, or a great number of them, and will assist them and the contractor in carrying on the work. Moving picture men will be glad to rent such a building, if not too far off the line of travel, to show their films, and the workmen will welcome such a diversion.

If the job is a long one and a good building is put up for this purpose, bath tubs can be placed in it, and for a small fee the men can obtain clean towels and soap. Arrangements can be made to furnish light lunches, such as sandwiches, pie, etc., and warm and cold drinks, as such things will be relished by the men. In other words, make the club house of real use to the men and they will enjoy and use it to their own and the contractor's benefit. If negroes are employed, provision should be made for them separate from the whites, but outside of this the place must be one of open democracy.

The Young Men's Christian Association is doing much in connection with this class of welfare work among workmen. They began by furnishing such places to trainmen on the various railroad systems and this has been extended to lumbering and to construction work. This is the industrial side of the Y. M. C. A. work. Shacks and huts of logs are built in the woods to furnish recreation for the lumbermen, and on construction work tents and other buildings are used. Papers, books and games are furnished for the use of the men and also opportunity for attending religious services. Everything is optional with the men. The young man placed in charge by the Y. M. C. A. co-operates with the contractor and his representatives, and the welfare work is planned and carried out jointly.

Men who are in need of employment are often sent to jobs

from the headquarters of the Association, and some who have been on prolonged sprees are sobered up and furnished with work. Thus men are rescued from themselves and put on a footing to earn money. This work done by the Y. M. C. A. is supported by subscription from citizens of the state in which the organization is operating. Contractors can get in touch with this association and arrange for such welfare work, by communicating with the state secretaries.

Running Commissaries.

The author believes that every job in the country should have a commissary on it. Such commissaries must be run to make a profit, yet the men must also be considered. Merchandise was once sold by ~~men~~ to make large profits on each item, but today the profits on single items are small, depending on the bulk of business to net a good profit on the money invested. In other words, small profits and quick sales is the rule of modern selling. Exorbitant profit in a commissary is an injustice to the men, as has already been pointed out. Some years ago the author was in charge of a number of commissaries for a contractor carrying on large operations. With a monthly pay roll of from \$5,000 to \$6,000 the men seldom purchased more than \$500 to \$600 worth of goods during the month. The profits made were about 75 per cent of the cost prices, netting about \$250 gross profits on \$600 of sales. The next year the author engaged in contracting for himself and sold goods to net about one-third gross profits and with pay rolls seldom running more than \$3,000 monthly, sold to the men from \$1,200 to \$1,500 worth of goods, netting from \$300 to \$400 profit. Not only were the profits earned increased but the men were better provided with food and suitable clothing, enabling them to do better work. When off duty they were clothed so well that they respected themselves much more than if they had been shabbily clothed. There were other advantages gained by the contractor, for in paying off the men it took much less cash, and the goods sold the men, except groceries, were bought on from 60 to 120 days' time, allowing the sales to finance the commissary after it was started.

In managing a commissary, if the needs of the men are considered, and if it is run on the principle that as soon as an employee enters the commissary or approaches it to make purchase, he is the boss and the contractor the servant offering his wares,

then the workmen are bound by another tie to the contractor, and the latter is receiving a benefit.

Defrauding Men.

There should be little need of preaching honesty to business men, yet if men are to be held as regular workmen they must be treated honestly as to their time. Mistakes will be made and differences will occur between employers and employees as to time and pay, but it is a wise contractor who so systematizes his office work that such things are reduced to a minimum.

To do this, some evidence of the time a man makes each day should be given to him. Then if a mistake is made, it can be rectified at once. With this, knowing his rate, the amount due on pay day cannot be disputed. If there are deductions to be made for board, medical attention, commissary goods and similar things, these charges should be made known to each man. These things are not difficult to arrange and if properly done the men will know they are being treated fairly both as to the time made and the deductions from their pay. On pay day, the work is made more pleasant, both to the contractor and the men. A contractor feels badly if he thinks the engineer has not paid him a fair estimate, so he should have little trouble in putting himself in the place of the workman who is not paid for the labor he has performed.

The Floating Laborer.

A large majority of the common laborers of this country have roamed so from one section to another that they have become known as floating laborers. The fault, if it is one, is not altogether theirs, for out-door work is plentiful in one section during certain months and stops during other seasons. Contractors, or rather some of them, are also compelled to roam, but even contractors can do something toward the movement that is now on foot to assist this vast army of men, who are compelled to roam to live.

Some features of this subject have already been touched upon and more will be written later on this subject.

Interest in Workmen.

Some years ago it was not uncommon to hear of a strike on the street railroads of New York City. Then a man was put in charge

of these lines who operated them without a strike. He had risen to the head of the greatest street car system in the world from the position of brakeman on a jerk-water railroad. He ran his men on the principle that any employee could see him in his office, if he had a real reason for the interview. The humblest man working for the company could take his grievance to the president. This showed his interest in those under him, and won them to him as loyal supporters and co-workers.

It is this kind of support that a contractor needs from his men. If he shows them that he is interested in them and has consideration for them, he will bind them to him as not even money will do. Nearly every man in this world likes to be noticed by those above him, and likes to feel he has their sympathy. If employers are democratic enough to know their men and speak to them, the task of handling men is made easier.

Making Money Off Contractor's Employees.

It is hardly necessary to comment further on this feature of handling men, as enough has been written to show the author disapproves of allowing others to board men, sell them goods, etc., to make their living off of the men. These are things that the contractor should do, if he wishes to control his men, and feel that they are his own.

Controlling Men.

A few years ago the author employed a young man, for a short time, as superintendent, who was so impressed with his own importance and ability that he did not realize that he did not control the men, but instead, that they controlled him. Two men who had just been employed were overhead talking. One said, "That young man is short and abrupt." "Yes," the other replied, "but that makes little difference, for every one says you can do just what you want on this job."

If men are to be worked efficiently they must be controlled, not only while they are at work, but also while in camp, and for city work, to some extent in their leisure hours. This does not mean that men must fear their employer or boss. Efficient work is not obtained through fear. Fear rather inspires men to shirk

their work, to do only enough to satisfy the boss and prevent him from finding fault. Many cases could be cited to show how men spruce up when such a boss is in sight and then soldier on him when he has left the work.

The air of a braggadocio will not win men or control them. A boss of this kind soon becomes the laughing stock of his men, and they have little respect for him. The gruff, bullying man will not win men, for as soon as laborers can they will leave him.

To control men, an employer must be fair and considerate, be patient and yet firm and know before he speaks just what he wants to do. He must be emphatic without being brusque. He must have an inborn courtesy that will show itself even when worried and overwrought with work. Such a man will win men to him, and in winning them, he will control them.

Handling Men.

If a contractor controls his men, in the best sense of the word, he will have little trouble in handling them to bring about the most economical results on his jobs. Anyone can stand over a gang of men and prevent them from loafing most of the time, but this is not handling them. Men to be handled to obtain the best results must be taught, then guided and finally stimulated in some manner to put forth their best efforts.

As a contractor, unless carrying on a single small job, cannot stand over his men, this work falls upon the foremen. Many of these do not know enough to do this, so they must be taught either by the general manager or by the contractor. Few laborers know how to pick or shovel so as to make the work easy for themselves and to do the most efficient work in a day. To use a shovel in dirt is quite different from concrete, either in mixing it or just shoveling. There is a knack in handling cement bags and dumping them, and in throwing a paper bag of cement so the bag breaks, dumping the load into the mixer or onto the mixing board, without untying the sack or wasting the cement. Spiking hammers are handled differently from striking hammers, while large timbers can be canted easily if men are taught the proper use of a cant hook. So it is with nearly every line of work. Some different motion or some small device makes the work easier for the workman and gives much more efficient results.

Slightly different shapes and sizes of tools play a prominent part in the efficiency of men. This can be learned only by experimenting and by investigation. Once learned, the foremen should teach the men. With new men being continually engaged the teaching becomes an endless job. Patience must be exercised in teaching such things, as some will be slow to learn, while others will be unwilling.

Even when men are taught these things they must be guided to continue along the right lines. Then too, it can hardly be expected to obtain great mental power or ability in the average common laborer, so that the foreman must do much of the thinking for most of his men. Thus he must guide them as to their mental work, trying to foresee their difficulties and anticipate their needs.

The greatest stimulant for efficient work is the method of rewarding men and the amount paid to them. This has been dealt with in Volume I of this treatise, Chapter VII. Besides their pay, men can be stimulated to put forth their best efforts by words of encouragement, by contests, by placing confidence in them, by having them help to train others, by throwing them on their own resources and many other expedients.

In starting new gangs of men, after the first day or two, after opportunity has been given to size up the men, they should be shifted in the various crews, so that the men can be handled in the most efficient manner. The young men should be placed in a crew by themselves or with a few old trusted employees. The experienced men among the new can be used in any gangs that are short handed, while the men who are rum-soaked or suffering from poor or insufficient food should be placed by themselves.

These men will not be able to do much work for a few days or a week. Their stomachs and muscles must be built up, and their nerves steadied. To discharge them may mean to lose some good men, while the chances are that some similar ones will be engaged to replace them. Light work will do such men good, while warm drinks furnished to them during working hours will be a benefit both to their stomachs and to their nerves. Special food should also be prepared for them, soft foods such as gruels and plenty of vegetables, and meat fed to them sparingly. Some may even need the attention of a doctor. These men so handled will soon feel better physically and mentally and will be able to do excellent work. Many of them will appreciate such treatment, while



Fig. 5.—A Floating Laborer, "Down and Out."



Fig. 6.—Types of Men Who Can Be Rescued From Themselves and Made Into Good Workmen.

some few will resent it. These can be let go. Some contractors will laugh at such advice, but it is founded on good practice and will succeed in the majority of cases. A contractor with a bunch of new horses or mules will treat them in a manner similar to this until they are acclimated and hardened and if horses and mules justify such treatment, men certainly do. A bath and new clothes for such men also work a wonderful change.

The young and inexperienced men should be placed under intelligent and well trained foremen, for next to old and trusted employees, these men should prove, if properly handled, the best asset in the way of workmen that a contractor can get. Such men, no matter what their past conditions and surroundings may have been, are ambitious. They want to show their physical strength, they wish to display their mental ability, they want to excel the older workmen and one another. This ambition can be quickly killed by several discharges for being inexperienced, and by association with the never-do-wells, the drunks and beats, for these young men turned off by several employers will be soured, and being without funds, they will be taught by other unemployed how to get food and drink from the city saloons, and will soon be classed in with the associates that they have been compelled to make.

These young men, especially those from the country, can be trained to do almost any work, both unskilled and semi-skilled. They need to be shown how to do work and trained in the contractor's methods.

Too many foremen believe it is their task to drive men only, and if they cannot be driven, then to discharge them. If a machine does not work, the operator finds out what is the matter, instead of throwing it to one side. The foreman is there to work the men and not to discharge them. In many cases it is easier to hire a foreman of average ability than to obtain men. It is the duty of foremen to teach men and to so guide the work of his gang as to build a structure or part of one.

The author as both a contractor and foreman has taught men to pick and shovel, to mix and place concrete, to handle heavy materials with ease and yet use fewer men than is the custom, and so with other lines of work. What one man has done others can do.

Men's motions must be watched closely, wrong motions changed and useless ones eliminated. A foreman standing like a statue with arms folded over his gang, cannot and will not do

such things. It is not necessary for the foremen to work in order to teach men. Few foremen can work themselves and run a gang of men. Rather the foreman should watch, advise, show and illustrate and do these things by moving around among his men, talking directly to one man and by a word of encouragement or a reprimand keep the men at work following correct methods.

Young, inexperienced men handled in this manner will soon be invaluable and not only will they perform satisfactory work, but also much more in the same time than older men. If a man cannot learn, then as a last resort discharge him.

The number of such will be few, for most men of average intelligence and fair physical strength can be trained to do manual work. This is shown in carrying on farm work. Men from cities or foreign laborers entirely ignorant of agriculture or the manual work on the farm are employed and quickly taught by the farmer how to be efficient farm laborers. If farmers can do this, surely contractors and their foremen can.

The greatest asset as to labor a contractor can have is to have in his employ a number of young men, for these can be broken to his own methods, and once taught and treated fairly, most of them will remain with him for years. The author knows of a prominent southern contractor, who worked mostly negroes, and had taken the trouble to train a number of young negroes in construction work, who found these men for years to be his stand-by. With them he started his important jobs, and when a piece of work lagged or other men could not be relied upon, these young negroes were moved from place to place and jobs were finished on time, or were changed from losing to profit making ones.

Such men want some recognition from their employer or boss, so it is necessary for the contractor or his manager to go among these men, from time to time, and get to know them, and assist in awakening their enthusiasm for their own work, for the job and for their employer.

This is essential in working men. Some years ago in the city of Washington a workman was asked the name of the contractor, or contracting company he was working for and could not tell it. Neither did he know the name of his general manager, only the nickname of his foreman, and he stated he had been working on the job for three months. This man was indifferent to these things, so it is likely he was indifferent as to his work, but the fault was

not his entirely. The foreman, the general manager and the officers of the company were at fault.

Contrast this with another company, that makes a speciality of building dams. The officers of this company are enthusiastic as to their own work. They believe in themselves and their dam, and by various means they instill this enthusiasm into their entire organization. They preach to their men that the company and the dam are all in all and in so doing their men give good work to the company's customers, and this means that the contractors themselves are benefited. This company has succeeded in interesting their men, and what they have done others can do.

The backbone of any labor organization should be a group or a number of groups of young men that the contractor has gathered, culled over and trained to his own methods. If an off season comes and some or all of these men must be laid off, their addresses should be taken and arrangements made with them to come back. Not all will come, but the majority will respond to a call, if they have been treated fairly by the contractor.

With such a gang of men, it is easy to add to the number, taking such as may come, culling out the undesirable ones as new men are obtained and retaining those that can be trained and welded to the organization.

Older men are not as pliable as the young men. They cannot be trained as well, nor are they as likely to be as cheerful about their work. Such men should be selected for special tasks, such as dumpsmen, cement handlers, and other jobs where they are not working in large gangs, but only one or two men at a task. This throws the man upon his own resources, and if he is given a large amount of work to do, it will either drive him off the job or make him willing to learn how he can do his work so he will be up with it and it will not be so hard upon him.

Men doing certain kinds of work, especially under adverse circumstances, can often be kept up to a high standard by singing. This is especially true of negroes and also of other classes. Tie tamping on railroads, steady shoveling, drilling with hammers, picking in large gangs and other kinds of work, such as loading buckets in deep foundations, are all susceptible of conforming in motion to the music of songs. Care must be taken that the time of the music should not be slow, but in such a measure as to cause a pace that gives good work without unnecessarily tiring the men.

Men can be worked in this manner through rainstorms and for many hours overtime, especially if hot coffee and some food is served to them while working. This singing method has been found beneficial in river work in times of flood. It also puts an element of cheerfulness and fun into the men's work. Monotonous work is made a pleasure to men by bringing music to it. Some employers frown down upon singing, while others who have used it know its great value. It has been a well known fact that miners doing rescue work have put forth Herculean efforts under the leadership of men singing well known hymns. One contractor of the author's acquaintance, who as a young man had worked in the Welsh coal mines, had headed a rescuing party in a mine accident, and had dug his way through a fall of stone at the head of a crew of men, singing hymns. He afterwards engaged in contracting, with great success, and was a firm advocate of inducing cheerfulness and good work into his men by singing.

In handling men care must sometimes be exercised in mixing men of various nationalities with one another. Negroes will mix well, and good work can be obtained from them and others, by working them with white men or foreigners, but few foreigners will work well together. An exception to these are the Norwegians and Scandinavians, but as a rule each nationality should be worked in a separate gang, at least until the men have been on the same job long enough to get acquainted. Provision must also be made to keep different nationalities in separate camps or buildings in a camp. Working different nationalities in separate gangs will sometimes start contests between them, and these are a help to the contractor, if he does not allow bad feeling to be engendered between the men.

Winning Men Against Their Will.

Few men of mature age want to feel that they are being trained or taught how to do work that they have been accustomed to do for some years. Men also object to being made more efficient without their own consent, and labor unions in most cases resent the introduction of scientific management amongst their members. Thus the contractor, who wishes to train his men to more efficient methods, finds the greatest obstacle is the men themselves. If he attempts to force these things upon them or to fight them, he is

likely to defeat his own reforms. Instead he must win them in spite of themselves.

All men object to some one standing over them with a stop watch, yet the timing of men is necessary, if an exact study is to be made of work. Therefore timing can be done from a nearby building, if one is convenient, or a shed, or even at some little distance from the men, standing near them only when absolutely necessary.

If new methods are to be put into use, do not take the men by surprise, and do not change too many things at one time. The old saying, "Rome was not built in a day," applies to this. To make many changes at one time will cause men to be in a chaotic state, and they will quickly become dissatisfied.

It is advisable first to show the men by some concrete example that they are to be benefited by the proposed changes, that either their work will be made easier or lighter or their earnings increased. Put it up to them from their own selfish standpoint and show them that they are not to be made machines, but that a chance will be given them to think and do for themselves and an opportunity given to earn more money.

Select some of the leaders of the men, the common workmen and mechanics, and explain the changes and new methods to them so that they will make objections, all of which should be answered. These men, once won over, will show the other men and answer their objections, or with their followers will put by with ridicule the cry of the discontented ones.

If union leaders can be reached and many union men are worked, it is well to call these into a conference and ask their opinions as to bettering the methods of carrying on the work. At such a conference careful and skilled talking must be done to lead these men to adopt the suggestions made as their own suggestions and thus secure their co-operation. A man accustomed to handling men can do this and make these men believe that the program to be carried out is of their own making.

Each case must be handled separately, but the idea is to prevent the men from becoming antagonistic, rather than to make them so, and then attempt to change things to pacify them.

Training Managers.

Trained men in any line of endeavor are a necessity—and likewise a scarcity—and as contracting is a profession the need of

such men is emphasized. Anyone just starting contracting has the need of trained men brought forcibly to him, while large construction companies are always on the lookout for men of this kind.

Men, to be of value, must be not only trained, but also ambitious and competent, especially those to act as superintendents and managers. Such men need only be known to be in demand, and command large wages; for in the end these men are the cheapest. Their mistakes are few and inexpensive and besides, from their training, they are enabled to devise many new labor-saving methods. It is the cheap, inexperienced man that is expensive.

There is need today for teaching engineering contracting in our colleges; for if contracting is a science, as is claimed by some, then it can be taught, and there is a growing demand among young engineering students to take up this branch of engineering.

However a course in college and a degree will not make a contractor, any more than it will an engineer; but as in the case of an engineer, it gives a good technical foundation upon which to build, and supplies the means to fit a man quicker for his life work, as it allows the young man to profit from the experience of others, assimilating from others the results that it would take years to obtain in his own career. The case is analogous to that of a man who spends months to calculate tables that he could secure in some handbook for a few dollars.

But whether a man has a college training or not, he must still go through the practical training in order to become proficient. Even if he never becomes an expert, at least he must be so well trained that his work will be efficient, and he can be relied upon by those who employ him.

This subject of training men is being given much thought in the twentieth century. Many of the large commercial organizations have come to realize the value of trained men—not only trained to their particular line of business or profession, but also to their particular methods and systems—and they are therefore devising apprenticeships and training courses so as no longer to be dependent upon chance to pick up efficient men.

The railroad companies are also beginning to realize that it is necessary to train men, instead of waiting many years for men to get the experience that will fit them for operating officials. Within the past decade one of the ablest railroad financiers and organ-

izers came to the conclusion that it was a wrong principle to wait until a man became 45 or 50 years of age before he was competent to be made a superintendent, for he may then have only from 10 to 20 years of usefulness before him. So this railroad official began to experiment with young men, to try to train them for such positions in from three to five years, so that they might become operating officials and possibly more efficient ones, before they are 30 years of age, when they have before them a career of from 30 to 40 years. Not every man selected stands the training, nor do all who go through the course measure up to the standard; but the venture may be termed successful and the results obtained have justified the methods to such an extent that other roads are copying them.

One mistake sometimes made by organizations that are now training men is to take it for granted that a large per cent of the young men selected will not make good; and going on this principle but little help is extended, so that many actually do fail. Thus money must be expended to train or partially train a much larger number than is needed. It may not be wrong to tell the young man starting that the majority fail, as this may act as a spur to him and put him on his mettle to make good; but it is absolutely essential that these young men be not only trained but assisted and guided and a watchful eye kept on them. Man has never devised a machine that did not need some attention in order to keep it running; and so it is with the human machine—if success is to be obtained, watchfulness and attention must be the price paid.

As it is possible to train men in commercial lines and in railroad operation, so it can be done in the contracting field, and men can be made efficient managers within a comparatively short time.

First, there must be a standard set for the selection of the men to be trained. Such a standard need not necessarily be high as to education, although the broader a man's education, the more likelihood of his being successful. However, the standard should be high as to the applicant's character and natural ability. As a rule the man should be unmarried, of good health and habits and of a buoyant disposition. But hard and fast rules for selecting must be deviated from at times; for the exceptional man will appear, who if accepted may prove quick at learning and be ready

to take up difficult tasks many years before others can be trusted to undertake them.

The contractor doing a limited amount of work can train men just as well as those operating on a large scale; in fact, better, for the young men will come directly under his care, and not be trained by a subordinate who may have little interest in the proposed scheme. He, too, is as much in need of trained men as his larger competitor, especially if he hopes to expand his business.

It is useless to train men and then not treat them so as to retain them in the organization. The course that they are put through will make them valuable in a much shorter time than if they "just grewed"; and hence if they can earn money much more quickly for their employer, they themselves must be paid salaries commensurate with their earning power. Many contractors seem to overlook this fact, gauging the salaries they pay, not so much by the earning power of the employe, but rather by the salaries others pay men of about the same age and years of experience. Thus as men are trained and become valuable they leave to go with other contractors who are willing to pay according to the value received from their employee.

One firm of contractors that has advanced by rapid strides within the last 10 or 15 years owes much of its success to the fact that the head of the firm has the ability to select good men as managers, and he pays such salaries as to attract them, and as they come to know his ways and methods, and prove their value to him, he keeps their salaries at a high standard, until today he has a larger staff of high salaried men and is paying higher wages than almost any contractor in the country. This really accounts for his success. By keeping his men satisfied he has held the same staff for years. The earnings of such men more than offset their salaries.

The selection of a course of training will vary somewhat with each contracting organization, just as the courses for the same degree vary in our leading colleges, but the general studies and methods can be the same.

First of all, the man to be trained must have some knowledge of mathematics. The more training and the greater the knowledge he has received in this line, the easier will be his other work; for applied mathematics is the foundation of all the professions except those of *belles lettres*. Arithmetic, proportion and algebra are absolutely essential, while geometry and trigonometry will be found

a great advantage in solving many problems. Elementary mechanics should likewise be studied, and the general principles of electricity. If the applicant has not had this course of training he should be sent to a night school, put under a private tutor, or given a course in a reliable correspondence school.

If anyone would ask upon what side of contracting most contractors are weakest, the author would not hesitate in saying the clerical or office end. Therefore he would start the young man in that part of the work. The accounting should be the first thing to tackle. He should not only be taught the methods, but should be shown the reasons for using these methods. The routine work is the small part; he must obtain a clear understanding of the entire system. From this he should be given the task of making up special reports, to show the application of all clerical work. The gathering of such statistics will give him a comprehensive knowledge of the entire subject of contracting. This once obtained, he will be able to take in the details much better, and this recording and rehandling of the details will then be the next step.

The author knows that many will differ with him as to this; but from experience and a close study of successes and failures in contracting, he does not hesitate in asserting that those trained in the general principles first and then made to cover the details, get a broader and more comprehensive training and their rise is more rapid. It must be remembered that the training of clerks and bookkeepers is not being considered—these start with the simple details and work up; but rather the men who are to handle important contracts, the future general managers and partners.

The next task should be the time keeping, the making up of pay rolls, the handling of the workmen's individual accounts, and the actual paying off of the men. This will bring the beginner into close touch with the vast army of industrial workers. He will get to know these men from their worst side—the grasping of money, whether it has been earned or not; he will learn the petty deceits, and the frauds practiced by foremen to obtain money for themselves, both from the contractor and his employees. He will be impressed with the importance of having these things correct and of keeping the men satisfied. In all of this work supervision must be given the man, but at the same time he must be placed on his own resources and made to rely on himself. He should be taught not to worry his superiors with useless questions, but to find out

things for himself; but it will be well to explain to him the underlying principles of everything he is given to do.

At this stage he should be shown the importance of supplementing his work with reading. He should follow articles in the contracting and engineering journals, the proceedings of societies, and read books covering contracting and engineering in a general way. This reading should be kept up the rest of his life; and later when he gets to handling construction work, he should read books on the various classes of work being done, such as concrete, excavation, sewers, railroads and other construction. These books should be referred to from time to time.

After time keeping, he should handle cost keeping, and the collection of all cost data. Then he should be taught the analyzing of costs, and the use of cost data. This will give him an insight into estimating and the methods of doing work and the building up of a contract system and organization. He will learn of the various classes of work, their units, the sequence of events in carrying on construction, and many other details that will prove of value in the next steps of his training.

From cost keeping he will go to the first work that will bring him into intimate touch with actual construction, that is, the handling of supplies and materials. He will receive and check materials and supplies. In doing this, more than in cost keeping, he will learn prices and see the need of closer buying. He will learn of wastes and how to prevent them. He will, if he keeps the proper records, get to know how much of each kind of supplies is needed weekly for machines and different classes of work. He will begin to learn of the care and repair of machines and tools.

In handling materials he will learn that the work of men is dependent upon receiving regular supplies of the materials, of the proper storage from the weather and to prevent them being re-handled uselessly. He will be brought face to face with executive problems, and learn not only how they must be solved, but also how to devise expedients to overcome unexpected delays and difficulties. He will now be an important part of the organization, the success of the entire job depending upon him. In receiving and handling the supplies and materials, he will have his first experience in handling the men and teams that must work under his direction. This will be valuable experience for him, for he will get to know men, and as his forces will be scattered and difficult to watch he will need

to use his head to keep them busy and know they are following instructions.

This might be termed his preliminary training and it will cover a period of from one to two years.

The next step begins the real training for construction work. A small ditch has to be excavated to let off some rain water, or some similar job needs to be done, and the young man is given a small crew of men and set to work as foreman. This done, he is sent with his crew to assist some foreman, and he becomes a sub-foreman. Here he learns to obey, for no man is fitted to command others until he has learned obedience himself.

From sub-foreman he is sent with an extra gang to do odd jobs, his men being changed frequently so he will learn that different individuals must be handled in a variety of ways. From extra gang, he is given the foremanship of a gang doing some hard, monotonous work, where he will experience the daily routine grind of doing some difficult task, that will ordinarily take the heart out of the average man.

Then as occasion arises he can be given a job where he may have to handle several forces and rely much on his own judgment. Thus by changing from job to job and from one class of work to another he will gain experience under different general managers and on various kinds of work under many different conditions.

On some new job he can be sent out as assistant to the man who is to run the work. Here he can help to plan the job, organize the forces, assist in buying machines, materials and supplies and learn much that will benefit him. From this he could be given some small piece of construction to start and superintend himself, where he will have to keep his time and cost keeping, do his book-keeping and buying, run his gangs, and in fact be everything that a small contractor must be, in order to make both ends meet. Here will be his supreme test; and if he makes good he will go on with his work, working mostly under others, unless he shows exceptional ability, until he learns how to estimate, plan out jobs and start them, finally take charge of large undertakings.

Many young men selected will fall by the wayside. Some will have to be dropped soon; others will never get beyond the office work, making only good clerks; others will master these and some of the outside details; while a few will go through the entire course,

making first-class trained men and amply repaying for the time and money spent on all of them.

The Superintendent and General Manager.

The kind of a man to be selected for a superintendent and general manager is a problem for most contractors. One contractor needs a man to run a thousand dollar job, another a hundred thousand dollar contract and a third a million dollar undertaking. The same requirements are not needed for the managers of these different jobs. A man who might make a great success of a small undertaking would be a failure in handling a large job, so that the standard to judge a man by is the work that he is to do, for a small job cannot give the profit to pay a man ten thousand dollars yearly salary.

One contractor says the type of man that is hired for a single job and discharged at its completion is not worth having. This is so of any size of job, but the statement should be modified somewhat, for if a man is not competent to undertake a second job he should not be retained to complete the first. However, this brings up the question as to whether or not it is a good policy to change managers during a job. Some contractors are very much opposed to changing superintendents, while others do not hesitate to change whenever necessary. These two extremes are both wrong. A competent man should, if possible, be retained on the job during its life, as a new man is bound to lose much in picking up the threads that were dropped by the old one, but to retain an incompetent man may mean to lose much more than to make a change, even several changes if need be, before the right man is obtained.

Not only the size of the job but the character of the work must be a deciding factor in choosing a manager. A man may be competent to run a job of limited size if he is given some assistance and supervision, while the same man put in charge of a piece of work where he is thrown entirely upon his own resources and it is necessary to decide upon important details that are out of the ordinary, may fail.

Within the past few years much has been written upon the qualifications necessary for a manager. Mr. Frederick W. Taylor specifies ten different qualifications, which should be found in a manager—"Brains, education, special or technical knowledge, manual

dexterity or strength, tact, energy, grit, honesty, judgment or common sense and good health." The author believes, that this list is needlessly long. Judgment or common sense is certainly covered by the first qualification, brains. Education likewise covers special or technical knowledge. The author would retain the qualification of education and substitute in place of the other qualification the necessary training that he has dwelt upon in discussing the subject of training managers. This training would also cover the qualification of experience, for experience would be gained in the man's training. Manual dexterity or strength is not necessary in a manager, it is an asset at times, but unless a man can keep in practice in manual work, he soon loses the knack of it, and to attempt to do something in front of a gang of men, when out of practice, means to draw from the men smiles and later ridicule. A man of brains can teach men and instruct them how to do things without possessing manual dexterity. The author knows this from personal experience. He can do more harm with a monkey wrench than he can do good, yet he has instructed men to do work both well and economically.

Neither manual nor physical strength are necessary for leadership. It is said that Buffalo Bill ruled his wild west troupe by being able and ready to whip anyone of them at any time, but fighting is not necessary in contracting. Many small men without special strength have been great leaders. Each individual of the old guard was a giant of strength as compared to Napoleon, yet he led them and they became a wonderful fighting tool in his hands.

Energy and grit, as a rule, go together. Energy is a capacity for performing work, while a definition of grit might be firmness of character. A man of energy must have firmness of character to continue indefinitely at work, and this is grit in dealing with himself. If a man has grit as to his own labors and views he is likely to have it in his dealings with others. Energy means determination and grit means determination.

Education is a requisite these days for success in any line, it is the power that moves the world. "Put money in thy purse," said the greatest English author, and to this could be added, "Be educated, for education and money rule the world." However, there are two kinds of education. One pertains to books and that training received in schools and colleges. The other education is that built on a primary school education and by reading and from practical

experience gained in doing things in the world. Book learning and college training is most valuable, but many men who could do little more than write their names have made a great success of their lives.

The education gained from practical experience can hardly be purchased with money, while unfortunately for the college graduate, the education and training received in college brings but slight returns to its possessor. A competent, trained and experienced designer can be engaged for a thousand or two a year. An attorney, who may have barely secured his sheepskin, but learned in the ways of the world, commands fancy fees for his work, while he relies on hired assistants, more learned than himself in the law, to handle the details that he himself is unable to do as well, and pays them a mere pittance as compared to the fees he is paid for the services.

Lincoln was a man of ordinary education, as far as schooling went, yet he was educated by his experience in the world, and was one of the greatest presidents that the United States has had. Many of the ablest engineers of the world have not been college graduates. Mulholland started as a laborer with the Los Angeles Water Company, but he was the engineer that has built one of the great aqueducts of the world. Cooper has harnessed the great Mississippi river, yet the author is informed that he is not a college graduate. The great engineers of a century ago were self-educated men, for there were few engineering colleges in America at that time, and these men had to discover principles and lay down the laws of the science and art of engineering. Peter Cooper was one such man, Edison is another.

These men were not bound over by precedent and what was considered good practice; this is one of the weak points of the college graduate. His training, to some extent, robs him of self-reliance. Precedent is well to know, but the able man makes his own precedents for himself. He is an originator, and the average engineer is not, at least not for years, until he has learned much through experience. A general manager should be educated by all means, but the education from experience should be considered as well as the education obtained in a school or college. Until within recent years, few of our successful contractors have been well educated men, as that term is commonly used.

Mr. Taylor names ten qualifications, the author would say that these ten when analyzed are resolved to seven and two of these,

energy and grit, go together, leaving in reality but six. Mr. Taylor further states that there are plenty of men to be found who embody three of these qualifications; that four make a higher priced man. A man combining five is hard to get, and one combining six, seven or eight is almost impossible. Thus, it is seen that when the number is reduced to six, and judging men by this standard, a man who possesses six qualifications should make a perfect manager, and the perfect man does not exist.

Mr. Leonard C. Wason, a contractor of prominence, says that a successful superintendent must combine at least seven of Mr. Taylor's qualifications; that the superintendent must have a personality which drives to activity several hundred originally unorganized men who are without special interest in the company or the result; that he must have such tact and judgment as to weld these men into a harmonious working force, cheerful and self-respecting, with high morale, and ultimately with enthusiasm for the work in hand. He further states that a superintendent must have an honor so fine that the company is ready to leave in his hands its reputation and its funds; that his special training must be such that dangerous operations are carried on as a matter of routine without worry to himself or the company, yet with a constant oversight of the thousand chances for accident or perhaps death which may occur to the men in his charge. His forethought must be such that he sees ahead, and provides for all the problems which are to come up, some of them months later; his temper so good that he never loses self control under the most provoking circumstances, but is able to take with the best grace any changes in his plans, and to work in that close co-operation with the company which is so necessary to make an effective contracting organization.

Such a man is desirable, but how is he to be selected, and when engaged, how is it to be known he is such a man until tried? Such men as these are seldom out of employment, and many of them cannot be induced to leave their present employment. Rules can be laid down for employing men, but men can only be proved by trying them. If suggestions for planning and laying out jobs given in this treatise and for handling men are followed some of the work and troubles of the manager will be eliminated, but in many cases these things are not done and thus managers must make up for the deficiencies of their employees.

Both gentlemen quoted have reference to superintendents and

managers for large organizations. The small contractor cannot employ such men, and the contractor carrying on large undertakings cannot find many such men, so men must be tried and rejected until the proper one is found, or else men must be trained as outlined in this chapter, for both large and small jobs. Thus the man is known from the beginning and new ones are being perfected to take the place of those who drop out or to help to expand the business.

CHAPTER VII.

OFFICE FILING SYSTEMS.

NO MATTER how small or large a business a contractor or a corporation is carrying on, some form of a filing system must be used. At one time the filing of records was a simple matter for a contractor, as he had only a few letters and bills which required filing away, many of which were rendered only monthly; but business methods have improved; the pendulum has swung the other way and instead of only a few records, there are now a multiplicity of records, and the tendency is to keep too many, requiring more correspondence than is necessary. With cheap postage and typewriters and dictographs to receive dictation, letter writing has become a craze, and much time and money is wasted by useless letters. A systematic study of any business and its needs will allow the elimination of many letters, and some suggestions will be made along this line.

Records to Be Filed.

Records kept by contractors may be divided into several classes and all of the following call for filing:

- Letters.
- Invoices and Statements.
- Vouchers and Receipts.
- Estimates.
- Maps, Profiles and Plans.
- Contracts and Specifications.
- Daily Reports.
- Progress Charts and Reports.
- Cost Keeping Records.
- Record Books.
- Catalogs.
- Photographs.
- Articles in Papers.

Various Filing Systems.

Systems of filing used for many kinds of business are not applicable to contracting, for several reasons. Much of the filing for a mercantile business is in regard to selling, and there is no

direct selling in contracting. Then, most business houses have permanent offices, while many contractors are moving from one town to another and move their offices with them, although some of the larger contracting companies now maintain a permanent headquarters office. This, of course, simplifies matters. Another reason for a decided difference in filing methods is that contractors' records are not easily divided by yearly business, but instead, by contracts for different jobs, some of which extend over a few months, while some may last over a term of years, and where guarantees for construction and maintenance are given, records must be kept even after the jobs are finished. The filing systems in use in commercial houses, devised by the experts do not include these features, but such men can make changes in these systems to suit a contractor's need.

It is easy enough to file or put away a paper, letter or record, but it is a different matter to find it when wanted. It is rather humiliating not to be able to find an important letter or paper, in the presence of a stranger or other business man and it is often the cause of much worry and waste of time by the entire office forces to go on the hunt for a misfiled paper. Thus in devising a filing system or in deciding upon one to install, the necessary thing to keep in mind is the finding of the papers rather than the filing of them. The system must be so simple as not to need the services of an expert, allowing any clerk to care for the filing, but there should be definite rules to govern the work. It is an easy matter to devise a filing system, but many such are freakish and impractical, for much time is wasted in finding the papers filed. To find a paper easily it must be filed properly.

Many methods of filing have been devised for different kinds of records. Horizontal filing calls for shelves or pigeon holes upon which, or in which, the papers are placed flat. To find a record, the proper shelf or space must first be located, then all the papers must be removed from that compartment and the paper hunted up by handling the entire pile. In this method many compartments are crammed full, while others have but a few papers in them. An index or catalog must be made of records filed in this manner, so that the proper compartment can be located in the filing cabinet.

Other methods call for the use of blank scrap books or boxes or drawers, in all of which the papers are laid flat. Consequently these are but variations of the horizontal filing system.

The most used method today is the vertical filing system. This means filing papers on edge in some kind of a container, usually a drawer. The papers are placed in folders made of stiff card and separated by guides that stand upright and keep the papers in position. The guides as well as the folders are indexed so that the file is catalogued and indexed within itself.

The Basis of Filing.

The first requisite for filing for contractors is a method of filing according to contracts or jobs. That is, the records for each job or contract should be kept by themselves. If the contract is small, all records for one job may be kept together, but if it is a large job, one lasting over a term of years, then the sub-division listed above may be used, and each job's records, under these various headings, kept together.

For this purpose two methods may be used. Each job may be numbered, and the number placed on all records either by a rubber stamp or in a blank space printed on the form or letter. The other method is to name the job and refer to it by name, each record marked as suggested above. The objection to using numbers is that it is hard to remember and associate them with the proper job, especially when a large number of contracts are undertaken each year. It necessitates the keeping of a card index, by numbers, to give the name and location of the job, so that in the end it is the name that counts. Consequently the author no longer uses the number method, but employs names only.

The selection of a name is sometimes simple, for instance, if a job is located at Rome, N. Y., it may be called "the Rome job." Another one may be called "the Altoona job." Then again, a large canal contract may be "the canal job," but if several contracts are secured on one piece of construction this becomes confusing and again the names of towns must be used.

Should a number of camps be established on the same job and each camp is operated independently, a local name may be used to designate each camp and thus keep its records distinct. If a number of sewer or paving contracts are secured in the same city, then it is well to denote them by the official name, as "Storm Sewer Contract No. 20," and "Sanitary Sewer Contract No. 6," but even for these the better method is to give each the name of some street,

as "the Euclid avenue sewer." Thus even a new clerk or time-keeper knows at once the designation of any contract. Another thing to commend this method is that it is adaptable to either a large or small business. If a contractor has but one job or a dozen he may use the system of names, which is for any class of construction—railroads, buildings, wagon roads, tunnels, sewers and other structures.

In devising any system for doing work, for filing records or keeping books, the man doing a limited business is frequently ignored, and the methods described are meant for extensive undertakings. The author believes this is wrong, and his experience is that anything to be of value must be adapted to small undertakings as well as large ones. In fact, most things should be adaptable to small units. They can then be enlarged or multiplied as a business grows or expands.

Filing Letters.

Letters may be filed in three ways: under the name of the writer or addressee, or under the title or subject matter of the letter, or by numbers, that is, numbering each letter and indexing the numbers and title or name of addressee. Few people use the name of the writer of letters to file them under, except where a number of men in the same corporation have a voluminous correspondence, such as the president, vice-president, secretary, treasurer and other officials. Then each person has a filing system in his office and there is a duplication of cabinets, etc. Many large corporations keep all of their records together.

It is a good principle in letter writing never to include two subjects in one letter. No matter how many letters it takes or how short they are, make a different letter for each subject. At the time of writing, this may not seem important, but in filing and future reference it will mean the saving of much time and worry, and simplifies all filing. The method of filing by subjects is not to be commended, except in a general way. Placing a subject title on each letter has been tried by many large corporations, and as a rule this method gradually goes out of use.

There are several reasons for this. First, it is often difficult to choose a title that aptly describes the subject. The person answering the letter will seldom copy the title in replying. If the title is long, it is not copied in full by the clerk in filing. A few weeks

or a month afterwards, it is seldom possible to remember the exact title, and a weary hunt is the result, if the correspondence is to be found. Thus titles soon disappear from letters, and the names of the writers and addressee are used. The United States Postoffice Department, which carries on a vast correspondence, uses the initial of the writer and the date to identify letters, with very satisfactory results.

However, for contractors, the subject matter of letters gives a number of excellent divisions for filing letters, and quickly referring to them. For instance, a contractor's correspondence is about the following general subjects: obtaining new contracts, bonds for contracts and insurance for various purposes; existing contracts, correspondence with owners and their engineers; legal matters pertaining to contracts, including permits and licenses; quotations on materials and equipment; purchasing materials of all kinds; bills and accounts, including banking affairs; correspondence regarding labor, and applications for positions; letters regarding estimates and classification of work, including extras; general correspondence within the contracting organization, between different offices and also between department heads within the same office (these letters may be termed departmental correspondence); general correspondence with outside parties. As a business broadens other headings will suggest themselves.

Thus with a large correspondence these heads can be made:

- Obtaining Contracts.
- Bonds and Insurance.
- Owners and Engineers.
- Legal Matters. } Permits.
- } Licenses.
- Quotations.
- Purchasing Materials.
- Bills and Accounts.
- Applications.
- Estimates and Classification.
- Department Letters.
- General Correspondence.

A case, cabinet or drawer or a part of a drawer can be assigned to each of these headings, and the letters indexed in each division. It must be remembered that the subject of indexing is not being considered at present, but only the general method of filing and the sub-division under that of filing letters.

Filing ordinary correspondence by numbers is not to be commended, for there must still be an index of names or titles, and the same objection that exists against numbering jobs holds good

in filing. However, for certain purposes numerical filing has its uses, just as titles are of use for some records. For most filing of letters, alphabetical filing by names with numbers as adjuncts is in the author's opinion the best system.

As to filing letters, the dates are just as important in many cases as the names; yet in most filing systems, little attention is paid to the date, except as to the year. In nearly all cases, with contractors the month is important, and often the week, and when this is true the filing should embrace dates and names.

The filing may be done under a general heading or as one unit, or it may be divided into a number of units under the various headings as indicated. Even where the business is small, with only one job and the contractor spends his time in his camp and does most of his own office work, the different headings are to be recommended, as letters are not only filed easier, but are readily found when needed.

The simplest form for filing letters is the box letter file which can be bought for fifteen to twenty-five cents each, in almost every stationery store. The box files are considered by many as being crude, and as compared to many modern methods they are; nevertheless, they may be adapted to some needs and for contractors doing a limited amount of work they will answer the purpose.

A box may be labeled for each subdivision and the letters filed under the name of the writer or addressee. Where many letters are written to the same man a box file may be reserved for his correspondence. The tabs on the sheets of the file can be changed from letters to dates, and each sheet may be made to divide off letters sent and received each week. Thus to refer to these letters means to handle this one box and if the date is known the letter will be found instantly. One box will hold the correspondence for six months. This is a very satisfactory way of caring for a small correspondence, except that the boxes take up a large amount of shelf room. These boxes may also be used for filing bills and many other records, it being necessary only to change the tabs to suit any purpose. The author has used them extensively at times for filing various kinds of records besides letters and bills. Fig. 7, shows an improved box of this kind.

Many cabinet filing systems have accessory filing boxes, transfer boxes, see Fig. 8, to be used in storing old records or letters that need only an occasional reference. Such boxes are cheap, and

they hold the folders that are used for receiving the letters in the cabinets. These boxes, with a supply of folders, may be used for direct filing and have the advantage over the other filing boxes of allowing the man's name and dates to be written on the tab of the folder. A much more extensive system may be devised with these boxes than with the former ones. A box may be used for a few names only, if desired, or it may be arranged according to dates. Folders, if necessary, may be cut and marked for each day in the month.

A set of these box files may be used for each contract, and when the job is finished they may be condensed and filed away. Correspondence should be kept for some years after a contract is finished, as it may be necessary to refer to it.

For a large correspondence, or for keeping it in a more condensed form, vertical filing cabinets may be used. These may be arranged under the headings previously indicated, and folders are used to hold the letters. When dates are an aid in keeping the correspondence, the tabs may be dated. Folders may also be marked with the names and likewise with subjects, as many different kinds of folders are sold for these cabinets. The folders are divided off with heavy index cardboards, and not only the entire alphabet may be used, but index cards may be obtained with the first two or three letters of a name. Likewise numbers or dates or series of the three may be used, and also divisions may be made of states or localities. These again may be divided alphabetically for names. With these folders and cabinets a most comprehensive vertical filing system may be devised.

For a limited business a single cabinet may be used and with the index cardboards it may be made to cover a number of contracts and subjects. For a more extensive business a number of cabinets will be needed.

As soon as most business men adopt this vertical system of filing, they want to use a card index. This, in the author's opinion, is a great mistake. A card index is a most useful thing for many purposes and the author has used them and is still using them, but for most vertical filing purposes they are unnecessary and entail much useless work. For keeping letters and similar records, to use a card index means to employ a clerk for this special purpose, as there is much labor in keeping it up to date, and if such an index is only a day or two behind it is of little use. With the proper

index boards and the tabs of all folders marked, the vertical filing cabinet becomes its own index.

This brings us to the consideration of indexing the drawers and cabinets. For a large business a cabinet or a series of cabinets can be used for each heading given in this chapter, such as letters, invoices, vouchers, estimates, etc., and again different cabinets can be used for the various headings given under "Filing Letters." For a small business one or two cabinets can be made to cover all the filing, by properly labeling the various drawers.

The purpose of the filing system is defeated by using flimsy supplies, as the index cards will sag down and become so rumpled as to be hidden in a full cabinet. Flimsy folders will curl and buckle so as to hide the names on the tabs and make the papers difficult to handle. Serviceable supplies are essential to both accuracy and speed. Index boards can be used for years and money spent on them is not wasted, so they should be either of very stiff card or for a more expensive filing system of light enameled steel. For permanency and much use on either the card or steel, adjustable metal label holders can be used. Some of these are quite elaborate and make reference to the contents of the file both simple and easy.

It is well for the index cards or guides to be of a different color from the folders. In fact, a color scheme can be developed to show different records, or locations, or dates. Likewise different-colored folders can also be used to denote different subjects. The guides are the index and they must not hide one another or the folders. For this reason the guides should all have left hand tabs on them, and the tabs on the folders should be right hand. Nor should the various tabs on the guides run clear across the file, unless they are separated by a large number of folders, so that the folders can be readily seen. Fig. 9 shows folders and guides so arranged. Straight-edge folders will not admit of this.

When indexing by name, the simplest arrangement is by alphabetical guides reading from A to Z. This, though, may mean many folders under one letter, necessitating much time in finding letters. To overcome this, subdivisions under the letters are used, such as Ba-Be, Bi-Bri and so on through each letter of the alphabet, except where only a few names occur under a single letter. Some of the filing systems purchased use two guide boards of different colors or with the tabs printed in different-colored inks to make them stand out in contrast. One guide is to show where the

division starts and the other to show where it ends. The folders have a large enough tab on them to take the name and also the address of the correspondent. There is also room to place a number, the number corresponding to that on the guide board. This allows the folder to be placed in the file almost automatically, as it is not necessary to think of the first letters of the name. This, though, must not be confused with numerical filing.

This method is ideal for filing letters except for those that come under the headings of Obtaining Contracts and Quotations. For the first, the better method, unless a contractor confines his work to a very limited area, is by location. Various new jobs will be located in different states and they must be followed up from their inception until the contract is awarded. Thus the guides can show the names of the different states and the folders can show either the names of cities or that of different corporations, if more than one job is being followed in a state. These jobs are always referred to by their location, when the names of officials are not known, or are not easily remembered.

For Quotations the filing should be done under the names of the articles to be purchased. Thus the tabs of the guides will bear such titles as Concrete Mixers, Cars, Scrapers, Shovels, Hardware and many others. The letters from different merchants are filed by name in folders, alphabetically, under the various titles on the guides. Suppose recent quotations are wanted on iron pipe. Open the cabinet marked "Quotations," look for the guide tab "Iron Pipe" and under it will be found the folders of different dealers, giving quotations on pipe. Another method of using the folders is to have under each guide tab, twelve folders each labeled according to the months, January, February, etc. Each month's quotations are then kept in these folders, so that only recent quotations are obtained by taking those from the folder for the current month.

One method of filing letters is to give each letter written a number. The answer to it, when received, or the letter that caused the original letter to be written, is given the same number. Then the letters are filed under their numbers and a book or card index is kept, showing the number, date, name of addressee and writer and subject matter of letter. This means that one person's entire time must be given to the filing and indexing of letters when fifty or more letters are written and received in a day. The num-

bers run for a year and at the end of the year a new series is started. This method is a cumbersome and expensive one and cannot be recommended.

When the correspondence is heavy and a filing clerk or clerks must be employed to care for it, the use of a card index and the filing of letters in modern cabinets by subjects, numbers or names is a good system. A card index can be referred to much quicker than a large filing cabinet full of folders, and often the necessary information can be obtained from the card. Then, too, the card will show a record of the correspondence if the proper information is placed on the card. Each card should bear the man's name, dates of letters and answers, and the subject matter, the letter or number of the file and the filing drawer. One line is given to each letter and its answer, so that a card will serve for a number of letters to the same man or company. A valuable feature of the card index system is that it may be adapted to cover any condition that may arise and can be used for names, dates, numbers or subjects. Letters may be crossed indexed and also indexed in several different ways. A number of different companies make these filing systems and issue pamphlets as to their use, and they are willing to send their experts to install and explain their systems.

All filing systems must take in consideration the taking out of papers or letters. Anyone, with these modern systems, can find letters in these files and can replace them, but as a rule the replacing should be done by the person who does the original filing. When a folder or letter is removed an "out card" with the proper record on it is put in its place, to be removed when the folder is replaced. Such cards can be purchased from the dealers. A filing system to be of value must be kept up to date. The first thing each morning the letters of the previous day should be filed.

Directions for Writing Letters.

In carrying on correspondence the rule should be established to have all letters addressed to the company or in the name of the contractor. These may have on them "the attention of Mr. Blank," or in addressing the letters the initials of the original writer of the correspondence or the man in charge, may be placed on the letter for the proper attention. All letters should be signed in the firm's name per the name of the writer of the letter. This may



Fig. 7.—An Improved Box File.



Fig. 8.—Transfer Box for Filing or Storing Records.



Fig. 9.—Right Hand Folders and Left Hand Index Tabs.



Fig. 10.—Alphabetical Sorting Box.

be done on the typewriter or with a rubber stamp, the first method being preferred and the writer's name added in ink.

Letters within the organization are apt to multiply and consume much time. These are necessary, otherwise important matters may be overlooked and employes will not be kept up to the proper standard in their work. But for many purposes small printed forms may be used, with the title of those using them printed on the forms. Thus, a general manager or superintendent can have forms saying, "Referred for report." "Note contents and return." Many other such form letters will suggest themselves, and caution should be given that all such letters be complete, but condensed. Forms transmitting reports, plans, vouchers and similar things may be used. Printed letters with blank spaces left for certain insertions, and letters for instruction and reports with blanks left for the information to be reported, will not only save much time, but will also show the specific information wanted and how it is to be reported. This means an outlay in printer's ink, but it more than pays for itself. For small organizations such forms may be made up on various kinds of duplicating machines at small cost.

There are great extremes shown by individuals in letter writing. Some individuals and companies will not write letters that are absolutely necessary, not even to keep their correspondence up to date. As to the department letters, they will not use them. Others go to the opposite extreme and write entirely too many letters, not only to outside people, but within the corporation. It has been stated that on one of the large railroad systems that an economy expert effected the saving of 500,000 business letters within a year. This means money saved in clerk hire, stationery and some postage, but most railroad letters are carried without postage on their own trains.

Department letters are necessary, but care must be exercised to see that useless letters are not written, and yet different officials and clerks are kept advised of many transactions. Such correspondence within the organization may be simplified by keeping the letters regarding any one subject together, using clips for this purpose. To illustrate: A contractor writes to his engineer asking for some data regarding all of his jobs. The engineer sends this letter attached to one of his own to the superintendent of one job, who answers attaching his letter to the batch. Again the engineer sends out these to another superintendent, and this is

continued until all the desired information is obtained. The engineer now writes his report and sends it attached to the entire correspondence, to the contractor, who now has before him all data on the subject and who may see how promptly each man attended to his letter writing. This entire bunch of letters, if filed away, makes a complete record that may be consulted without hunting up the individual letters. Copies may be kept in each office of the letters that are attached to the bunch, but many of these may be form letters.

Many letters can be saved in making purchases by using order blanks. These blanks can be printed and numbered and by means of carbon or other devices they can be made out in duplicate or triplicate. The different sheets should be of varying colors, so as not to cause confusion. Full instructions should be printed or written on the order blanks so that letters need not accompany them. Conditions under which the orders are given can be printed on the back of the original order sheet.

Such sheets can be filed much easier than letters as they will not take up so much space. They can be filed according to number, or by dates, or alphabetically according to the names of the merchants from whom the goods are purchased.

Copies of all kinds of correspondence should be kept. A typewriter is excellent for this purpose for carbon copies may be made and filed. A typewritten letter also adds much to the appearance of correspondence. If a typewriter is used or if letters are written with pen and ink, wet copies of letters may be made with a letter press, or carbon copies may be made by writing letters with a stylus pen. There are also on the market rapid roller copiers that make copies of typewritten letters or those written by hand. This copier makes a facsimile showing signature and correction, which carbon copies do not do. Its work is not only rapid but more than one copy can be made of the same letter, and where only one copy has been made of a letter old letters can be copied. It is said to be more economical than carbon copies.

Few business men care to get letters signed with a rubber stamp or with a facsimile signature. It takes the personal element out of the letter. Some men also use a rubber stamp reading, "Signed in the absence of Mr. Blank," when they allow a clerk or stenographer to sign their letters. This, too, is bad practice, as the clerk can sign the name per their own without calling so

much attention to the fact. This custom is also looked upon with disfavor. Another rubber stamp used at times reads, "Dictated, but not read by Mr. Blank." The only excuse for this is that a mistake may have been made in the letter and the writer does not wish to accept the legal responsibility of the mistake. If the letter is of this importance he should read it over and make corrections before the letter is allowed to leave the office. A business man does not care to receive letters from people who may try to shirk their responsibility.

In writing letters and before they are filed away it is necessary to see that answers are received promptly. To obtain such results a set of folders should be cut for an index and numbered from one to thirty-one.

This file is known as the "attention file." Copies of letters that should be answered are placed in this file. Thus, if a letter is written on the tenth of the month and an answer should be received by the sixteenth, the carbon is filed temporarily under the sixteenth. Each day the folder corresponding to that date is taken from the file and laid on the desk used by the writer of the letter. Early in the day he goes over the letters in this folder and if replies have not been received, a second letter is written and dispatched. Again the carbon is placed in the "attention file" under another date, five or six days ahead. At that time the letter again comes up for attention and if a satisfactory answer has been received the letters are placed in the permanent file.

This is an excellent and inexpensive method of keeping correspondence up to date and of compelling answers to letters. The author has used it with great success. At times five or six letters had to be written to bring a reply. There are on the market now several types of sorting boxes or follow-up systems. These have substantial guides, folders and tabs on them and include date and alphabetical folders. They are meant both as an attention file or follow-up system and a box to sort and file papers temporarily before they are placed in the permanent filing cabinets. Such devices are time savers and keep a business up to date. (See Figs. 10 and 11.)

Filing Invoices and Statements.

The filing of invoices and statements is a much less complicated matter than filing letters. Until they are paid the invoices



Fig. 11.—Follow-Up Box by Dates, and Alphabetical Sorting Box Combined.



Fig. 12.—Arch Board File for Temporary Use.



Fig. 14.—Document File for Folded Papers, Such as Vouchers, Contracts, Etc.



Fig. 13.—Contrasting Old and New Methods of Filing Invoices.

must be referred to and frequently used, but after being paid they are seldom needed for reference. Thus there are two needs for filing. First, temporary filing must be made, then permanent filing.

The temporary filing may be done in several ways, but first the invoice should be checked against the goods delivered. Then it may be placed in a temporary file. This may be an ordinary box file, but better still a board file with a U-shaped hook on it with alphabetical index cards (see Fig. 12). Then the invoice may be referred to easily and entered in the day book or journal without being taken from the file. An attention file or sorting box previously described can also be used for this purpose. Here it may remain until the bill is paid, then it may be placed in the permanent file. If a voucher is used in paying bills then the invoices may be attached to the paid voucher and all filed away together.

A limited number of bills can be filled in an indexed invoice book, which resembles a large scrap book. Only one edge or end of the bill need be fastened in the book so that a large number of invoices may be stuck to each page. Long bills may be folded and so attached. The invoices are first placed according to the names of the dealers and then in order by dates. The invoice book is indexed by letters with tabs on the pages or can be bought with an index in the front of the book. The first kind is to be preferred.

Thus for a small number of invoices only two things need be used, the sorting box or board file for temporary use, which will last indefinitely, and the permanent filing books. However, an invoice book is a crude filing device for invoices.

Fig. 13 shows a contrast of the old method of filing with a new. Bills and invoices come in assorted sizes, but a size in common use is about $8\frac{1}{2} \times 7\frac{1}{4}$ inches, being cut from folio size stock 17×22 inches, making six to a sheet. This allows drawers to be used about 10×9 inches with guides and folders of appropriate size, and invoices of large size can be folded to conform to the standard size. This allows bills to be filed alphabetically and arranged in the folders according to dates, making it very simple to refer to old invoices and to preserve them for some years.

The author's preference is to file invoices and statements with vouchers, when the latter are used. The invoices are kept in the

temporary file until the paid voucher is returned through the bank or by the merchant, when the invoices are folded and attached with a clip to the voucher and filed.

Filing Vouchers and Receipts.

When vouchers are used, a more extensive system of filing should be employed. Of course the invoices may still be filed by themselves, but the better way is to have the two together, as then the receipt for the payment is with the invoices. If vouchers are filed by themselves they may be filed by name or numbers. If names are used, vouchers and invoices can be placed in folders and filed as suggested under letter filing. Statements, if desired to be kept, can be filed with the invoices. As most vouchers are folded it becomes possible to use a narrow filing cabinet. This kind of a filing cabinet admits of the use of names, numbers or dates for indexing the vouchers. If numbers or dates are used for indexing then a card index is used to show the names and the dates of the vouchers. If, for instance, the voucher of The Fancy Mixer Company, paid on January 1, is wanted, the card index is referred to and it is found that the number of it is 1052; this number is looked up in the filing cabinet and the voucher located. If the voucher is filed by name this is not necessary as the file for "F" can be referred to and all of this companies' vouchers found and the one for January 1 picked out. A narrow filing cabinet for vouchers is shown in Fig. 14.

Vouchers simplify the handling of invoices and statements and likewise of receipts. When vouchers are used they themselves become receipts, so all vouchers should be considered receipts, and all receipts should be taken on voucher forms. When vouchers are not used receipts taken on receipt forms or on bills can be filed with invoices. Modern business methods, however, do not call for the giving of receipts as much as formerly. Checks and vouchers used in paying bills are considered as receipts and many business houses have discontinued receipting bills or sending receipts, except when actual cash is paid. Post office and express money orders are considered as checks.

Thus if a receipt is desired, especially one having on it the signature of the payee, a voucher must be used in paying accounts.

Voucher Forms and Their Uses.

There are many kinds of voucher forms in use, some devised by the users of them and others by experts employed by companies that make a specialty of printing vouchers. All of them can be divided into two classes: voucher checks and record vouchers. These can be made in duplicate or triplicate. It is also possible to use a stub to a voucher, but if a copy is to be retained it is easier to make it in duplicate by means of carbon, at a single writing, rather than duplicate the writing on a stub. If the form is properly devised the voucher check can also be made a record voucher or the duplicate used as the record.

Vouchers vary somewhat in size, being from seven to eight inches long and from seven to nine inches wide. The dimensions give a sheet about twice the size of an ordinary check, which is about three and a half by eight inches. For this reason some banks and merchants object to vouchers, although a voucher folded once becomes the size of a check. But to overcome the objection of size, many voucher checks are made with a perforation through the middle, making it possible to tear it apart, one piece being printed as a check and the rest as the voucher. The check part is deposited in the bank and the rest with the record of the transaction is retained by the payee. The check part returned through the banks to the remitter, with the payee's endorsement on it, gives the former a personal receipt.

The duplicate of a voucher can be a plain sheet of paper, but as this does not duplicate the printing, it is sometimes confusing in referring to it and an original form may have to be referred to in order to understand the duplicate.

Most duplicates are made an exact copy of the original. This is the case in the samples of vouchers shown, but many users of vouchers have duplicates with only the date, number and place printed on them and the name of the bank, the rest of the duplicate sheet being blank. Others have duplicates with extra printing on them, showing distribution of accounts and other necessary information. If the duplicate sheet on its face is similar to the original, then the back of the duplicate can be used for distribution or other data. Where carbon is not to be used to make the duplicate, then the sheet can be double the size and be printed on both sides, save that part to be detached as the check. This

| | |
|---|---|
| <div style="border: 1px solid black; border-radius: 50%; width: 30px; height: 30px; margin: 10px auto;"></div> <div style="border: 1px solid black; border-radius: 50%; width: 30px; height: 30px; margin: 10px auto;"></div> | <p style="text-align: center;">T. A. JAMES & CO., INC. Brokers and Commission Merchants PHILADELPHIA.</p> <p style="text-align: right;">No. _____</p> <p>PAY TO THE ORDER OF _____ \$ _____</p> <p style="text-align: right;">DOLLARS</p> <p>To Corn Exchange National Bank T. A. JAMES & CO., INC. Philadelphia, Pa. _____</p> <p style="text-align: right; font-size: small;">FOR DEPOSIT ONLY THIS CHECK</p> <hr style="border-top: 1px dashed black;"/> <p style="font-size: x-small;">DETACH BEFORE DEPOSITING. ENDORSEMENT OF CHECK IS SUFFICIENT RECEIPT.</p> <p style="font-size: x-small;">The above check settles our account with you as follows:</p> |
|---|---|

Fig. 15. Showing One Style of Voucher Check, Size 7x8 Inches.

| <div style="border: 1px solid black; border-radius: 50%; width: 30px; height: 30px; margin: 10px auto;"></div> <div style="border: 1px solid black; border-radius: 50%; width: 30px; height: 30px; margin: 10px auto;"></div> | <p style="text-align: center;">BERWYN MILLWORK AND LUMBER CO. No. _____ BERWYN, PA.</p> <p style="text-align: center;">DATE _____</p> <p>PAY TO ORDER OF _____ \$ _____</p> <p style="text-align: right;">DOLLARS</p> <p>TO THE BERWYN NATIONAL BANK BERWYN MILLWORK AND LUMBER CO. BERWYN, PA. BY _____</p> <hr style="border-top: 1px dashed black;"/> <p style="font-size: x-small;">DETACH BEFORE DEPOSITING NO RECEIPT REQUIRED</p> <table border="1" style="width: 100%; border-collapse: collapse; font-size: x-small;"> <tr> <th rowspan="2">CHECK NO.</th> <th rowspan="2">DATE OF SERVICE</th> <th rowspan="2">DESCRIPTION</th> <th rowspan="2">AMOUNT OF SERVICE</th> <th colspan="2">DEDUCTIONS</th> <th rowspan="2">NET AMOUNT</th> </tr> <tr> <th>FOR</th> <th>REMARKS</th> </tr> <tr> <td style="height: 100px;"></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </table> | CHECK NO. | DATE OF SERVICE | DESCRIPTION | AMOUNT OF SERVICE | DEDUCTIONS | | NET AMOUNT | FOR | REMARKS | | | | | | | |
|---|--|-----------|-----------------|-------------|-------------------|-------------|-------------------|------------|------------|---------|------------|--|--|--|--|--|--|
| CHECK NO. | DATE OF SERVICE | | | | | DESCRIPTION | AMOUNT OF SERVICE | | DEDUCTIONS | | NET AMOUNT | | | | | | |
| | | FOR | REMARKS | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |

Fig. 16. Showing a Second Style of Voucher Check, Size 7x8 Inches.

a check and as each is perforated the check is easily detached. The lower half of Fig. 15 is for listing the invoices or accounts that the voucher is meant to cover. The voucher in Fig. 16 is very similar but the lower half is so ruled as to show each invoice or account in detail. For most commercial purposes this form is to be preferred over the first one. Fig. 17 shows a record voucher or remittance letter. A check must accompany this. The voucher shows the account in detail, so that items cannot be disputed and the duplicate keeps the same information for the remitter. This voucher does not call for a receipt as the check acts as one. However, a receipt form can be made at the bottom of the voucher, or a receipt can be attached to it to take office receipts, or when actual cash is paid. Thus with a voucher of this kind either a check can be given in payment of the account, or cash and a receipt obtained. Only a few of the printed lines would have to be taken off of this form to make room for a receipt. Space forbids showing other forms, but for most contractors these general forms with a few changes can be used.

A contractor transacting all of his business from one office needs only an original and duplicate of his vouchers, the original going to his creditor and the duplicate being retained. A contractor having a number of offices and a main office should use for his subordinate offices a triplicate sheet. The voucher being made up for an account at a branch office shows the entire transaction. The triplicate sheet is retained at this office. The original and the duplicate are then sent to the contractor's main office. Here the account is audited and, if desired, can be entered from the voucher into the bookkeeping system. The duplicate is retained at this office and the original is sent to the creditor. Thus the vouchers are made out at one office, audited and countersigned at the main office and paid from there. If an account for a field office is opened and paid by the main office the triplicate sheet is sent from the main office to the branch office after it is audited and thus the branch office has a record of what accounts the main office has made in its behalf. Thus if a set of books are kept at each office, all the money transactions can be duplicated at each office.

If a contractor has several offices and uses vouchers similar to the two forms shown in Figs. 15 and 16, then even the small petty cash items at his branch offices can have vouchers and receipts

made for them at the branch office, where the duplicate is retained and the original sent to the main office. The author, by the use of two styles of vouchers, has been able to handle a large business in this manner with a great degree of accuracy and also prevent dishonesty in cash accounts. Invoices from the subordinate offices are attached to the vouchers before sending them to the main office where they are audited and then filed.

The column on the vouchers shown, headed "description," is of little use, as the date, number and amount of invoice, identifies the bill well enough. This column can either be eliminated or made smaller and in the space so provided a distribution column can be shown. In this column the distribution as to the accounts to which the items are charged can be noted. Thus an invoice for \$29.25 for car wheel boxes and bolts, can be distributed in this column as \$20.25 for Repairs and Renewals, covering the car boxes, and \$9.00 for Expense of Work.

If invoices are entered on voucher forms as soon as the bills are checked with the receipt of goods and this distribution made, then the voucher takes the place of a journal for these notations, journalizing is abbreviated, and entry can be made of these invoices directly to the ledger, whether the latter is kept in a book or on cards. The same distribution can be made on the back of the duplicate and triplicate and when so done the list of accounts can be printed on the back of the sheets, saving much writing. A list of charge accounts for contractors is shown on pages 85 and 86 in Volume I. This method of handling vouchers is simple and yet covers every detail of a contractor's account and throws the filing of the records in the main office, reducing the amount of filing in the sub-offices.

When checks are used, the canceled checks and check stubs must be filed, for these are receipts. As they are small, hundreds of them can be filed in a small space. A small box file will admit of a limited number being filed by name, or they can be tied up in bunches and filed in a vertical filing cabinet, being labeled by dates and numbers, each bank's checks by itself. For a large business a special filing cabinet can be obtained for old checks.

Where a contractor keeps several bank accounts he can still use vouchers by having the place for the bank's name left blank and inserting it with a pen or rubber stamp, or he can have the name printed for each bank in red after the vouchers are made.

Some banks will stand the expense of having its name printed on blank vouchers, in order to obtain the contractor's account.

Filing Estimates.

Few contractors file their estimates as they should, yet nothing is of more importance than estimates, and if they can be referred to easily they will be found of much use and may be the means not only of saving money, but perhaps of making additional money.

Estimates are of two kinds—those made for bidding purposes and estimates of work done. These last are those earned by the contractor and if he has sub-contractors, also those earned by each of them. Whether a job is secured or not, the estimate made on it for bidding purposes is often of value, especially in bidding on other jobs, using it as a check. Sometimes another contractor receiving a job fails or gives up the work for some reason. Then bids are asked on the job again and the original estimates are needed in order to make up a new proposal.

If a job is secured the proposal estimate should be referred to frequently to see that the work is done at a cost within the estimate, and if not, wherein the variation lies and the reason for the difference. Records made for such purposes and ready reference made to them would mean to eliminate a decided element of chance in contracting. The up-to-date manufacturer knows when his work is not being done within his estimates of manufacturing costs, yet many contractors do not worry about these things until it is too late to remedy the mistakes. This shows the need of preserving these records and filing them.

Monthly and final estimates are those upon which payment is made to contractors. In some cases, weekly estimates are paid. From such estimates the financial arrangements for the job must be made. This is the immediate use of them, but during the entire life of the job these estimates must be referred to in order to analyze the cost records. Rough estimates of work done each day may and should be made for many classes of work in order to know daily the relative cost of the work, but such estimates should be revised when the engineer's estimates are received. This shows the need of filing estimates so that every detail of them may be used when necessary. Estimates paid sub-contractors must be used each month when making up the new estimates.

All of these estimates are generally made out on large sheets that can be folded and backed with the name, date and other details. As they are not numerous, it becomes an easy matter to file them. As such papers are secret, it is advisable to have them filed so the case may be locked.

If the sheets are not folded they can be filed in a flat drawer cabinet, but a cheaper method is to use a vertical cabinet, such as shown for vouchers. This will hold the folded sheets and will occupy less space. Some contractors, for a few sheets, use pigeon holes in a desk, but this is insecure for such valuable documents and they can readily be misplaced. A fireproof vertical filing cabinet is not too expensive for such important papers. If the business is small only one drawer may be needed; the other drawers can be used for vouchers and other papers.

Filing Maps and Plans.

Too little attention is paid by contractors to the preservation of maps, profiles and plans. Contractors have two sets of such papers to file—plans made by themselves and those furnished by the owner or his engineer.

For those made up by themselves, there are the original drawings, the tracings and the blue prints. These should each be filed separately. Then further divisions may be made of each, according to the character of the drawings. For instance, those for camps or buildings may be filed under that head, plans for concrete forms under that heading, plans for false work by themselves and so on through a long list.

The drawings furnished by the owner or his engineers will all be blue prints so that this simplifies the filing somewhat. It is customary to furnish the contractor with one copy only of these prints, except where two or more must actually be used on the work. A contractor should make it a rule to have always two, or rather one more than actually needed on the work. This extra copy is for filing in the main office of the contractor, as it is needed as a permanent record to show many things. Some corporations, when they make changes in plans, now request the contractor to return to them all copies of the old plans so that a confusion of plans may not occur, but any contractor is foolish to return his extra office copy.

This copy, as soon as it is received, should be stamped with a rubber stamp or marked in a suitable manner with the date and hour of receipt. Then if changes are made in any plan, the new print may be marked in the same manner. Thus a record of all changes and time of making them is kept. The name of the clerk or official of the contractor receiving and dating the plans should also be marked on them. By such a record extra pay may be obtained for expensive changes and time allowance may be asked for and made to cover delays in receiving plans and for changes. In case of a lawsuit these things are of the utmost importance. Without an extra copy of the plans, this record is difficult to keep even in a diary, and thus is not as impressive to a court and jury as is the print, so marked.

Maps, profiles and plans are always difficult to file. Many methods for doing this have been devised by contractors and engineers only to be discarded for other methods. Profiles and long maps are generally in rolls. Plans are of all sizes. Those made up by the contractor may be given standard sizes for different purposes, but the contractor cannot control the size of plans furnished by the owner. Today some sheets embrace many details and are very large.

The author's method is to separate the plans made by the contractor from those received from the owner. Then the extra copy properly marked with date of receipt, etc., is kept separate from the others. These not being used as frequently as the other set may be folded and backed and filed away in a manner similar to that described for filing estimates. It is well, too, to have these under lock and key. The filing of these may be done under the name of the kind of structure for which they are meant.

For the other drawings a large cabinet of wide and deep flat drawers is generally used (see Fig. 18). These are all right for flat drawings but they are not so well adapted for rolls. Nothing is so hard to file for quick reference as these rolls. They roll around and become mixed up in drawers and likewise in pigeon holes, so that a large number of them must be handled to find the right one, yet the favorite way to file them is in drawers.

When only a few drawings must be kept, the various ones may be marked with names and filed in pigeon holes or in the drawer of a desk, or even on a shelf, but when the number increases pigeon holes should be used. With a larger number the most satisfactory

method is a filing cabinet of drawers, previously mentioned. With a large number of drawings it is almost impossible to file them under names. The better method is to number and letter them. Letters are used only for changes, and for a series of sheets. Thus the original drawings of an arch bridge may be given a number as 50, and the detail working drawings will be 50A, 50B and so on.

If a drawing is numbered 62 and a change is made, it may be numbered 62a, using small letters for changes. The objection to letters is that there is but twenty-six of them, but this may be overcome by using two or more letters, as 50AA, or 50AAA, or by using letters and numbers as 50A1 or 50A2.

The drawers of the cabinets are marked with these numbers in series according to the sizes of the drawings, as from 1 to 10 or 1 to 50. Then the drawings are all numbered and placed in their proper drawers. A card index must be made in which the name of the drawing is entered and the number as well as the drawer is marked behind the name. Small books are sometimes used for such an index, but the objection to them is that under each letter the various titles can not be entered alphabetically, so that it is much more difficult to find them, and then when a drawing is destroyed, because it is of no further use, the name still remains in the book, even if a pen is drawn through it to mark it out, still leaving a large number of names to go over in looking up any particular drawing. For these reasons a card index is to be preferred. Then when a drawing is destroyed the card is likewise destroyed. The names are always in alphabetical order and the index may be used much easier than a book.

A most useful filing cabinet for blue prints is shown in Fig. 19. This is a vertical blue print and drawing cabinet and has a door to it that can be opened out into a table to be used when referring to the drawings. The index to the blue prints is on the inside at the top of the cabinet. For a limited number of drawings this is an excellent filing cabinet. It keeps the blue prints in order, protects them from the dirt and from being torn and it would pay every contractor to have such a file in each of his offices, as the cabinet is ideal for daily use.

Filing Contracts and Specifications.

Contracts and specifications should be filed and preserved for several years, and where guarantees are given, even longer. Con-



Fig. 18.—Drawers for Filing Plans and Drawings.



Fig. 19.—Cabinet for Filing Drawings for Constant Use.



Fig. 20.—Arch Wall File.



Fig. 21.—Arch Board File Without Index Cards.

tracts and specifications should be written up separately and also bound separately, but unfortunately they are not, as most engineers make it a practice to combine them. With the present way contractors should file away under lock and key or place in a safe deposit box their signed copy of the contract with the prices in it. Then it is safe from fire and the idle curiosity of clerks. Copies with these items blank may be used in the office and on the work.

For filing, the contracts and specifications may be folded and backed and filed in vertical filing cabinets similar to the one shown for vouchers and estimates. One drawer will hold a dozen or more, as they do not take up much room.

Where the contracts are bound separately from specifications it is well to file them separately, as the specifications are referred to much more frequently than the contracts. For all of the various things mentioned, such as letters, invoices and statements, estimates, maps, profiles, plans, vouchers, receipts, contracts and specifications, there should be a rubber stamp to mark them with the name or number of the contract.

When contracts and specifications are drawn up in pamphlet form, they must be filed in small drawers, or in a manner similar to catalogues.

Filing Daily Reports.

There was a time when only a few reports were made and kept by contractors, but today the up-to-date man has a multiplicity of records kept, and these must be filed. Such records are kept on slips of paper, both large and small cards, and some are in the form of profiles and maps. Then there are various kinds and sizes of books. These records consist of daily reports, progress reports, cost keeping records, and record books, including diaries and book-keeping books. Daily reports are those pertaining to materials received and used, weather conditions, payrolls, amount of work done, and many other things that do not pertain to cost keeping. Progress reports are those that show the progress made daily, weekly or monthly. Most of them are made in form of charts or profiles. Every one is familiar with the many kinds of cost keeping forms.

Some of these reports soon become useless. For instance, a hauling punch ticket is a most desirable thing to make teamsters attend to their work, but sixty days afterwards it possesses no

value, the information it contained having been transferred to other forms. As with this, so with others. Thus we have two kinds of filing necessary; one may be termed temporary filing, the other permanent filing. With the first it is possible to calculate the amount of space needed for the filing and, as the reports will be destroyed at regular intervals, space for new reports is always provided. Many contractors will not destroy any kind of a report for several years. They make a great mistake in this. There is no use keeping reports that are never used. Any report recently made is likely to be needed within a short time, until a new estimate is paid, or the payroll met, or accounts are paid, but all of these things are done within sixty days and then the report has served its usefulness. When this is done it should be destroyed, as it is only taking up valuable space that could be used for things that must be kept for reference.

On the other hand, there are other reports that must be kept for years, as they contain information that is needed continually. However, many forms for cost keeping that are kept could be destroyed without any harm being done, if the cost keeping system is properly devised, but unfortunately most cost keeping systems are not devised as a whole.

In filing these various reports, one difficulty encountered is the many sizes and shapes of the forms used. This objection could be readily overcome by adopting a regular size for different kinds of reports, and sizes that conform to modern filing cabinets.

For temporary filing a number of cheap devices can be used, as well as regular filing cabinets. These last are expensive, but they naturally admit of easy reference. If these files are used, only a limited space need be assigned to each report.

For a limited number of reports, those covering a week or ten days, the cheapest thing is a stick file, either one to rest on a desk or one to hang on the wall. These can be bought for a few cents each and will last several years. The author uses some of these, but prefers the wall file to the desk file, as more can be used on the wall and the name of each file can be placed above it on the wall. Small clips can also be used for a limited number of reports. The various slips can be referred to much easier on a clip than on a stick file, and one can be taken out without molesting the slips above it.

Even a better thing for temporary filing is a small transfer

file to hang on the wall. This is a heavy wire file on a metal frame, the wire being cut a little above the center and the top piece is on a hinge (see Fig. 20). Thus the wire can be opened and the slip or card placed on it. The card should have a hole punched through it before being placed on the file. On such a file the reports can be gone over quickly and any report can be taken off without disturbing the others. Old ones can be taken off at any time and be destroyed.

An even better file than this is the double wire file on a board, the wires snapping apart to place on new reports (see Fig. 21). On this file index cards can be used to separate the reports if it is necessary. The reports, too, are kept in better shape, and with

| JOB No. | | DAILY REPORT OF WORK | | CARD No. 952 |
|-------------------------------------|----|----------------------|--|---------------------|
| NAME OF WORK | | DATE | | |
| CHARGE TO | | STREET OR LOCATION | | |
| HOURS LABOR | 5 | MATERIAL AND REMARKS | | |
| " " | " | | | |
| " " | " | | | |
| " " | " | | | |
| HOURS TEAMING | 16 | | | |
| EXTRA WAGON | " | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| LAWMAN & CO. 1000 N. 10TH ST. S. D. | | FOREMAN | | |

Fig. 22. A 4x6-Inch Card for Daily Reports, Used in Connection With a Card Index.

the board back they can be written upon. Box files can also be used for temporary filing, but small forms slip around in these boxes and get out of order. A card index file with the reports made out on cards can also be used, a sample being shown in Fig. 22.

When large permanent files are used, only a few compartments are needed for these temporary files, as the reports can be kept in bundles with elastic bands and a facing slip will denote the reports in each bundle. When daily reports must be kept a long time, they can be filed in the same manner as cost keeping reports, which will be described later.

Filing Progress Reports.

Progress reports are not numerous, as only one or two are needed for a job, and inasmuch as they are either on large square sheets or on long rolls of paper, they may be filed in a manner similar to maps and profiles. Progress reports are not essential, but they are excellent to show progress in a graphic manner, and a busy contractor can tell the progress being made on his numerous jobs by a few minutes' study of them. For jobs that must be finished quickly, when a forfeit is demanded for non-completion, or when certain progress must be made at stated periods during the life of the job, such diagrams will be found a great help not only in keeping track of the work done, but also in planning and outlining the entire job for weeks and months in advance.

Another beneficial feature is the plotting of diagrams and curves showing progress, costs and other important features. These two are graphic and tell a long story to the contractor in a few seconds. These reports generally mean a little extra cost, but the value of them justifies the expenditure.

Filing Cost Keeping Forms.

Of cost keeping reports there is no end. They may be divided into two classes. First, daily reports of work done and the cost; second, analysis sheets and office records. Included in the first are material reports. One great mistake, in the author's opinion, that many contractors and engineers make, is in making cost keeping a part of their bookkeeping. It should be only auxiliary to bookkeeping. If made a part of the bookkeeping system it complicates that work, complicates the cost keeping and makes a matter of hours of study to understand anything about either.

Then, too, the cost records must go through the bookkeeper's hand each day before definite results from them can be learned, and this entails much night work, or else the entries are not made until the next day, such delay frequently meaning an extra expense recurring, when it could be cut out if the cost reports were handled promptly. Cost keeping and bookkeeping should each be a distinct system, but, as is only natural, items must be entered from one to the other. Whether or not cost keeping is separate from bookkeeping affects the method of filing the many reports. Memoranda

from which bookkeeping records are made need not be referred to often, as the permanent record is in the books. This should be true of cost keeping records, but as a rule it is not. Few cost keeping records are complete. In the author's opinion, most of the articles and books that have been written on cost keeping do not go far enough. There should be some means of showing results for every item of work done, quickly, and of striking a balance each day; but those devising systems have not seen the necessity of this, with the result that they always leave off the balance book and the record book that which will allow the contractor to know at a glance not only what work is being done daily, but the cost, what money is being lost or what profit is being made. This is the important feature of cost keeping that everyone seems to overlook. The cost of a cubic yard of concrete is valuable information, but concrete may be only one out of fifty items of work being done, and all the cards must be assembled for each day, including the general expense and overhead charges, analyzed and a balance struck so that each day a definite knowledge is obtained of the standing of the work. It is the same idea that is made use of in the banking business. A bank does not wait a week or a month or a year to strike a balance; it does it daily for the money handled each day. The cost keeping records of a contractor should be treated in the same manner. To do this would soon place contracting on a surer financial basis.

These remarks may seem out of place here, but as previously stated, they affect a filing system. Daily reports can be divided into two classes—punch cards and slips, and written reports. On a properly devised punch card or slip, a record not only of work done can be shown, but also of cost, but after this record is transferred to another report, the punch card has but little value. For filing, punch cards should be made in not more than three sizes. The smallest size should be of the same length as the largest size is wide. The second size should be of the same width as the largest size, only shorter. Thus, the three sizes can be filed in a cabinet of one width.

Written forms for field records can with few exceptions be made of uniform width, the difference in size being in the length. Three and a half inches the author has found to be a good width. A size that will answer the purpose for most reports is three and a half by nine inches. Smaller forms can be used, three and a half

by five inches being a good size, although they can vary from a few inches long up to nine inches. If longer forms are used, say eighteen inches long, then for filing it may be folded. This is also the case if a wider form than three and a half inches is needed; seven inches can be folded to three and a half.

Another assistance in filing cost reports is to use the two sides of the card, when they are not needed for one report, for two different reports. Thus on one side of a card the cost of concrete work may be recorded and on the other side a record of the form work may be listed. Likewise on another card the materials received may be entered and on the reverse side the materials used that day.

This puts similar records together and saves much work, as well as space in filing. If forms are made of this uniform width they may be filed away for permanent use in modern cabinets. Such cabinets may be obtained with compartments meant to take forms of this shape and size. Card index systems are not necessary for this filing, as the various forms may be filed in separate compartments under their name or form number, and dates; concrete report, grading report, and so on through a long list. In having the forms printed it is always well to have a form number printed on each one, then the form number may be used to denote the form both in using and filing. Thus a filing compartment may be labeled "Form No. 16."

The reports may be filed in the cabinet according to dates, the last date on top. The current month's reports are kept loose in the compartment, but at the end of the month they are fastened together in some suitable manner. Thus each month's reports are in one bunch and any old report may be found quickly without an index. Some contractors number their reports in addition to dating them. This is generally a useless proceeding, as the date will answer every purpose of a number, even if a card index is used.

When odd sizes of report cards and slips are used, it becomes more difficult to file them, as compartments of different size must be used, and it is often necessary to index them. Under these conditions the reports must be filed in a manner similar to letters and the directions previously given are adapted to cost records.

Some cost keeping forms can be filed to good advantage in a card index file. Figs. 23 and 24 show records of this kind kept by a contractor on such cards and filed in this manner. Card

can be destroyed or transferred to other cases, but if the cards are kept for some years, then cabinets with drawers for filing these cards should be installed similar to the one shown in Fig. 25. Guide cards with dates and numbers can be used to separate these cards. The cards shown in Figs. 23 and 24 are meant merely to illustrate the size and manner of getting up these cards, as the arrangement for cost keeping can hardly be recommended.

Filing Record Books.

Record books and bookkeeping books are generally filed, after they are used, by placing them away in a file on a shelf or stowing them away in a chest or box. For a few books this is not a bad arrangement, but when the books become numerous, then it consumes much time to find the desired book.

A book should always be labeled on the back with its name and the dates from the opening to its close, as "Ledger, May 1, 1910, to January 30, 1912." If shelf room is easily obtained, books may be filed on shelves, all of one kind of books being placed together and arranged by dates. If the shelves are not already built, then they may be constructed of different heights to suit the books. Large and heavy books should be divided from one another by a thin board partition, as otherwise they are so heavy that when one is taken out, the rest fall toward one another, and the man replacing it will not straighten up the books and put it in the proper place, but he will place it on the end, out of order, as it is easier to do it. With the thin partitions this does not happen and the vacant space shows for itself, making it easier to replace the book there than in any other place.

Smaller books may be divided off ten or twelve in a group, and the very small books, such as time books, can be filed in large numbers.

Loose-leaf books may be used for many purposes, and are ideal for filing. The covers, if well made, will last for years and the leaves can be taken out and replaced at will. Old sheets may be taken from the binders and filed away at any time. Filing can be done at certain intervals, or at the end of a job. The old sheets can be filed separately or in bunches covering certain periods or subjects. These sheets mean to save much money tied up in bindings, and also they effect a saving in filing, as they do not

occupy so much space. Contractors have not used loose-leaf books extensively, but once tried they are preferred over the old books, except for a few purposes.

Modern filing cabinets can also be purchased for filing books, and they are especially adapted to the filing of used leaves from loose-leaf binders.

The Use of Catalogues.

To the ordinary contractor the receipt of a trade catalogue, unless he has requested that it be sent to him, means that it is given scant notice, and with many men it is generally given a resting place in the waste basket.

It is true that the main object of the manufacturer in issuing this printed matter is to sell his products; and although the contractor may not upon the receipt of such matter be at that time interested in these products, yet this same printed matter may have more in it of value for him than he supposes. It is also true that he can obtain one on request; but if a catalogue is needed quickly—and it frequently is—it should be in the office files, as in most cases it takes several days to obtain one by mail.

Catalogues in any number are bulky and it is a difficult matter to file them, but their value is such that one is justified in trying to overcome this objection, so as to have them for ready reference. Many manufacturers in issuing catalogues have attempted to so fill them with such valuable information that every recipient of one will wish to keep it. To this end many experts have been engaged to write catalogues, and the getting up of some of these trade books has cost thousands of dollars. The poorest catalogues, in most cases, are those written by advertising bureaus. The men thus employed know how to write "ads," and as a rule, they make a catalogue a series of "ads" that boost the product in question, but tell little of its use and other features that the purchaser wishes to know. Such catalogues find their way to the waste basket the quickest. A well written catalogue, containing valuable information about a certain class of machines, and also as to the methods of using them, and other features that will be a help to the purchasers, if well advertised, will be in great demand, and such a catalogue in the hands of interested parties will in the end be the cause of many sales. If the product is a good one, such sales will continue for some years on the strength of each catalogue.

Photographs are excellent for catalogues, but a book made up entirely of photographs is a poor catalogue. It will effect some sales but will not be as effective as one made up of good photographs and reading matter. The author readily agrees with some contractors and engineers with whom he has talked on this subject, that there are some catalogues that are not worth keeping, and many leaflets and circulars are the worst kind of trash. The consideration to be given catalogues must be based upon their merit. The value of a good catalogue can be set forth as possessing all or some of the following information: Photographs and descriptions of the machines or products; sizes, weights and capacities of machines; photographs and descriptions of the adaptability of machines, showing work done, and diagrams and photographs showing range of work; illustrations and names of parts of machines, so that extra parts can be ordered without chance of mistake. Such illustrations also show the simplicity of machines and their construction, impressing purchasers more than the use of many adjectives. Tables and information pertaining to the class of work done by the machines, that can be used in making up estimates, in planning work and in carrying it out, are a distinct addition.

Such catalogues as these are all worth keeping. A large number of them filed away means a library containing much information that can be used on construction work. A contractor, first of all, can keep himself posted as to new machines that are placed on the market, and also as to improvements in design and strength of old makes of machines.

By photographs and descriptions one can post up on many different methods of doing work, and by a series of photographs the various stages of a piece of work can be seen and studied. Sizes and capacities can be used in making up estimates; weights, sizes and dimensions will be found valuable in shipping and hauling outfits from one job to another.

Tables and other valuable information may be of use at any time. The author has had copies made of such things from catalogues to be placed in the hands of foremen and workmen for their guidance while at work.

The operation and layout of plants can also be studied and planned with a few good catalogues at hand. This is a most important matter. The author in visiting construction jobs in many

sections of the country has found many contractors, both young and old, lacking in information on this subject. Seldom are machines operated in the most efficient manner, and in many cases this is due either to a lack of knowledge of the machine itself, or of its adaptability to work, or of the best methods of operation.

Then, too, so many machines are served wrong, and products are not used in the proper manner, all due to the fact that the contractor and his superintendent and engineer have not considered that a catalogue is worth studying.

Much valuable data that does not appear in print other than in catalogues is available for use on construction work. A study of catalogues, too, is a great help in saving money on the purchase of machinery, supplies and materials. If a new machine is to be purchased and the buyer decides upon his choice after listening to the first salesman he meets, he cannot feel assured that he is getting the machine best adapted to his work, the best-built machine, or the lowest price on it. With a number of catalogues on hand he can make a study of every feature of all the machines on the market, decide upon the one best adapted to the work, also the best-built machine on the market, and if any information is lacking, he can write to the manufacturers for it. Then quotations can be obtained from a number of manufacturers for their machines, delivered at the nearest railroad station to the job. If a delivered price is obtained, it is easier to make comparisons and then the contractor knows just what the cost will be for the machine at his work.

A word of caution may be necessary here. The lowest priced machine may be the most expensive in the end, both as to construction and as to the work it will do. This is one thing that catalogues will aid a contractor in doing, namely, to decide without prejudice as to which is the best machine to buy. Expert salesmen can convince most buyers that their products are the best, that their machines are the best built, that the best materials are used in them, that they have the greatest range of work and adaptability, and that the price named is the lowest for a machine embracing all of these features. A purchaser's judgment is bound to be affected by such talking. The use of catalogues and the obtaining of prices by letter prevents all of this. Contractors

making frequent purchases of machines will find that this one thing will justify the care given to catalogues.

When new catalogues of the same manufacturers are received, it is not always advisable to destroy the old ones. A quick comparison will show whether the old one contains information that is not in the new one. If it does not, it is well to destroy the old one; but if it does, then it should be kept along with the new ones. The author once made the mistake of giving away some old catalogues that contained valuable information, thinking that he could obtain others, and was much disappointed to find that it was not possible to get them, as they were out of print.

Many small circulars and folders can be placed between the pages of catalogues and thus kept without trouble and can be found when wanted. Some manufacturers issue catalogues without covers and with eyeholes punched through them, so that their entire series of catalogues can be kept in loose-leaf binders, so that they can be referred to quickly. In many cases the manufacturers will furnish the binders to hold their catalogues. If they do not, the pamphlets can be bound between pieces of cardboard by means of long brass fasteners.

To keep catalogues for use, they must be filed in some manner for reference.

Filing Catalogues.

A few catalogues can readily be taken care of, but a large number are cumbersome and it is difficult to find a particular one when needed, unless they are filed away in some order.

Much has been written on uniform sizes of catalogues. Engineers particularly have deplored the great variety of sizes of catalogues, and several times during the past decade there has been an effort to have manufacturers adopt uniform sizes for their trade publications, having not over three different sizes.

The author believes it will never be possible to do this. Each manufacturer endeavors to make his catalogue distinctive, so that a user of it will know it at sight. If it is the same size as all others the distinction is lost. Said one manufacturer; "If every manufacturer would adopt the size of my catalogue for their own, I would change mine at once." This is the feeling and it is hard to change it.

We must face the conditions and file the catalogues as they are. One of the easiest ways to file a limited number is to place a small pasting tag on them and number each catalogue. These can be placed in rows on a shelf or in a book case or filing cabinet. An alphabetical index in a small book can be made of the catalogues, first by the name of the manufacturers, and second by the name of the tool or machine, as concrete mixers, dump wagons, and other tools. The numbers are repeated in the index, and in this manner any catalogue may be found in a few minutes. If it is replaced properly this system will be found quite satisfactory.

For a very large number of catalogues the best filing system is to use numbers and letters to denote the catalogues, a number for each manufacturer, and a letter for his catalogues. These are filed in a cabinet and a card index is used to list them. This is a comprehensive system of filing catalogues and will cover a period of many years and thousands of pamphlets and circulars.

The card index for such files can be cross-indexed for numbers, names of manufacturers and names of tools. The drawers containing these cards can be in the top of the cabinet. The pamphlets can be placed in folders in the cabinet or fastened by clips to stiff cardboard or guides. First the pamphlet should be labeled, showing the number of the catalogue, the number or letter of the drawer and date of receiving the catalogue. Bound books, such as some houses put out as catalogues, are treated in the same manner, only they are placed on shelves and the reference in the card index is to the shelf number or letter. One cabinet can contain some wide, deep drawers, some smaller drawers for pamphlets and circulars, drawers for the card index and shelves for the books.

Filing Photographs.

The use of photographs for contractors has been touched upon in Chapter X of Volume I. As these photographs accumulate they must be cared for so that they can be found when wanted. A common method is to place them in albums or loose-leaf binders, after being mounted on linen. For a limited number this is not a bad method, for each job can be filed under one binder, but when several binders must be used for a single job and the albums accumulate then it is a difficult task to find a given photograph of a



Fig. 25.—Card Index Filing Cabinet.

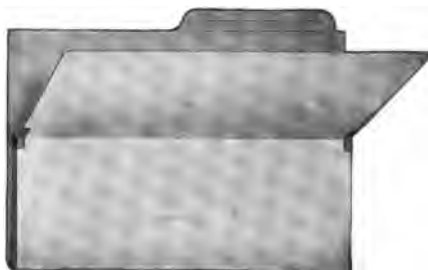


Fig. 26.—Photographs Mounted on Card, and Gusset Folder to Hold Them.



Fig. 27.—Newspaper Clippings Mounted for Filing.

certain date. This can be overcome by mounting the photos on linen, or several small ones on a card, and these filed in a vertical cabinet. Special folders with gusset bottoms can be purchased for this purpose and each folder can be marked and regular guides used to separate them, see Fig. 26. These guides can be made the index, or a card index system can be installed. Transfer boxes can be used to take the photographs as a job is finished just as with letters, invoices and other documents.

A Library as an Asset.

In the Addenda of the Volume I of this treatise lists of books are given that are useful to any one engaged in the profession of contracting. Books will not make a contractor, but a library of technical books will be found helpful, not only in carrying on construction work, but also in obtaining jobs and many other details that a contractor must handle. Mistakes can be prevented and new ideas gleaned by the aid of books. Thus a library, if properly used, can be a real asset to a contractor, just as catalogues are useful. It is needless to tell of arranging books for reference, but all matters to which a contractor may wish to refer, that may be part of his library, are not in books. Some are articles in papers, small pamphlets and newspaper clippings. These to be useful must be filed and indexed.

Indexing Articles in Papers.

Some engineers and contractors who take technical papers have them bound in half yearly volumes. These books are indexed, but such an index gives little information as to the details of the various articles. Thus many engineers and some contractors have adopted the practice of making a card index to all articles in which they find anything of special value. This practice has several advantages, for not only is it possible to place on the card some of the features of the articles, but under the heading can be quickly located articles in half a dozen papers covering a period of many years. The cards are easily referred to and can be carried in bunches in a grip, if it is desired to carry them on a trip. To assist in this indexing of special articles, many technical papers

publish an index, meant to be clipped up with a pair of scissors and pasted onto cards. A regular card index file is used to hold and index these cards.

Filing Articles in Papers.

Instead of keeping technical papers and having them bound, some engineers and contractors tear out the articles they wish to keep and file them. Vertical filing cabinets can be used for this purpose. The articles under one heading can be placed in a single folder, and the folder filed under its tab and by means of guides. When articles cover several classes of work a card index can be used and the articles cross-indexed under the various subjects. Numbers and subjects can also be used for the articles when a card index is used. The author's practice is to have some of his papers bound, and others he tears up, filing such articles as he wishes to keep in a vertical filing cabinet, using the tab of the folder as an index.

Filing Newspaper Clippings.

Newspapers publish many articles about construction work. Some of these are puffs for contractors showing the extent of their work and how the jobs are handled. Others regarding public contracts are articles finding fault with contractors and interviews with public officials regarding fault finding with contractors. They also report what business men have to say regarding the obstruction of streets and roads.

The first class of articles is preserved in order to help a contractor advertise himself, and the second class of articles to show, in case of a lawsuit, how the contractor has been mistreated, and possibly that he has carried out his contract according to law.

Newspaper clippings are easily mislaid and lost, and quickly become torn from much use. One methods of filing them is to paste them in large scrap books, indexing the books. A better method is to paste the clippings on cardboard and file them in a vertical filing cabinet in folders and with guides. If desired, a card index can be made of them. Fig. 27 shows some clippings mounted to be filed in this manner. These can be kept for years without being mutilated or lost.

[AUTHOR'S NOTE: The sample vouchers shown in this chapter were furnished by the Baker-Vawter Co., of Benton Harbor, Mich., specializing in designing and printing voucher forms. The author is also indebted to the Yawman & Erbe Mfg. Co., of Rochester, N. Y., for 10 reproductions of cuts used in illustrating filing devices, and to the Globe-Wernicke Co. of Cincinnati, Ohio, for 6 reproductions.]

CHAPTER VIII.

ORGANIZATION OF A CONSTRUCTION COMPANY.

THE advantages of doing business as an individual, or by partnership or in an incorporated company have been discussed in Volume I, pages 4-8. Some of the advantages and disadvantages of doing business as an incorporated company are set forth there, so this chapter will deal entirely with the workings and management of an incorporated company.

Organizing a Company.

An incorporated company can be organized for one of three reasons. First, it can be a one man business, and organized to separate the contracting business from his other interests. This man will own and control the company, giving enough of his employees a single share of stock, in order to have enough incorporators and directors. The incorporated company keeps the individual from becoming liable for debts made that exceed the stock, capital and other assets. Doing business as an individual would place the man's entire fortune at stake.

The second reason is to bring together a number of men, who have limited capital to operate alone, and thus strengthen them to undertake large contracts. Thus five or six men with capitals of from \$5,000 to \$10,000 could place themselves in a position to do much more work with a combined capital of from \$40,000 to \$50,000 and each member could take charge of a job or save employing a high salaried official.

The third condition is when a man experienced in construction, but with little capital, obtains others, possibly without experience but with ample capital, to form a company, giving him a working interest or some treasury stock. Thus the capital is furnished for a competent man to operate upon.

There is nothing to do in the first case except for the individual

interested to decide that he wishes to incorporate the company and then have his attorney draw up the incorporation papers.

In the second case it is different, the men must be brought together in some manner. This may be by mutual friendship, or it may have come about in bidding in competition to one another. In cases the men may be brought together by advertising, one man taking the initiative. At times the company may be formed only to do a single job. One well known eastern contractor makes a practice of organizing a stock company for each important job he obtains, as he has different men interested with him on the various undertakings.

Many experienced men have little capital, yet they can obtain private contracts at excellent prices. Their acquaintance with moneyed men, as a rule, is very limited, so they must either, through mutual acquaintances, by personal solicitation or by advertising obtain men to back them. This would seem an ideal combination, yet frequently it does not work well, due to the indifferent manner of organizing and drawing up the working agreement. One man is furnishing the brains and experience, the others the money, and both feeling that the success is dependent upon them. How this can be prevented will be brought out later.

The men once obtained, the amount of capital stock is decided upon, the amount each member is to take fixed, and the incorporators selected. The incorporation papers are drawn up by a competent attorney, and the papers registered with the proper state and county authorities. Then by-laws to govern the company are formulated and afterwards adopted. The capital is paid in and certificates of stock issued and a record made of this in the stock book. A set of bookkeeping books are opened up, a meeting of the stockholders is held and directors elected, after which a meeting of the directors is convened and the various officials elected and the policy of the company mapped out. Then the company is ready for business.

Name.

In drawing up the incorporation papers it is necessary to give the name or title of the company. There can be much in the meaning and selection of a name. Three general methods seem to be followed in naming construction companies. The first one is

to use the name of the principal stockholder, calling it the Smith Construction Company, or the name of one or more of the leading stockholders, as the Smith, Jones, Brown Company.

The second method is to give the company a name denoting the class of work it contemplates doing, as the Jones Concrete Pile Company, or the Foundation Company. The third method is to name the company after some town, city or state, or give it some geographical name or fancy title, as the New York Contracting Company, the Coastwise Dredging Company, or the Allboro Company.

What is desirable in a name, and should a name denote the business in which the company is engaged? The term construction company and also contracting company are both used in titles. Both denote to a great extent the line of business for contractors, for they both construct and contract. The choice of the two terms must be according to the fancy of those selecting the name, except that it sounds a little better to say the Smith Construction Company, Contractors, than it does the Smith Contracting Company, Contractors. The use of such a name as the Blank Realty and Construction Company may show that the corporation is engaged in both the real estate business and construction work, and at times this may be desirable, as is also the case with those engaged in both manufacturing and contracting, but as a rule, it is not well for contractors to have another name indicating a different business in their title. Competitors are able to use this to show that this company is engaged in another line to which they are giving most of their attention, and where states and municipalities are demanding that contractors be specially fitted and equipped for the work to be let, a company's name may bar them from securing a profitable contract.

A construction company, if it is chartered properly, can engage in other lines, but it is not necessary to show it in its name. In some cases these other lines are operated under subsidiary companies, thus placing each line of business squarely before the business world. A disadvantage of this is in the duplication of capital and in the added taxation that accrues. This, however, can easily be offset by the additional business that can be done by each company and also by the fact that if misfortune overtakes one company it may not affect the other.

Some contractors who are also engineers sometimes use the

name of the company to denote this, as the Smith Engineering and Contracting Company; or they term themselves engineers and contractors. At times this is done to denote that such a company, through the ability of its trained engineer stockholders, is exceptionally skilled in construction, while in other cases it is meant to show that they will undertake either engineering or contracting or both jointly. This brings forward the question as to whether or not a man should engage in both professions at the same time. Clearly he should not be both the engineer and contractor on the same job, although some men are. The two positions should not go together, for they are conflicting, as if the contractor wishes to evade the specifications, as engineer he allows himself to do so. It would be possible through two separate corporations to do both engineering and contracting, but if a man is to follow engineering he should not be known as a contractor, while a busy contractor seldom has the time to spend working as an engineer. There are contracting engineers who undertake engineering work by contract, but do not do construction. Many of the best engineers and contractors believe a man should not mix the two; that is, he should follow either the profession of engineering or that of contracting. This does not prevent a contractor from having an engineering department and designing structures to be approved by the engineer for the owner, as is done in bridge work and other classes of construction.

If it is desired to show that the members of a company are engineers, it can be done by printing their names with their degrees and membership in societies on the company's letterheads. This is certainly more dignified and covers every purpose.

When a company is named for an individual, the stamp and character of the individual is to some extent placed upon the company. If the man is known to be in good financial condition, a man of strong character and of marked ability and one experienced in construction work, then the company bearing his name will more than likely enjoy the same reputation, and in this way act as an asset in obtaining work, but such a company is more than likely to be looked upon as a one man company. If this man retires or dies the company is more than likely to go out of business.

This is an objection to a name of this kind. A man may surround himself with many able assistants and partners, and even

after he has retired the business could go on in the same manner, except for the fact that the stamp and name of one man has carried along the business. Then too, if the stock of the company is sold to others the name of the old owner is affixed to the business, and the charter must be amended or new incorporation papers taken out to change it. This is the case when any men's names are used in the title of a company, with their disappearance from the company, other men object to doing business under the old name, unless it has become a great asset, which is rarely the case in contracting.

This objection is not valid with a company named from a town or state or given any geographical name. The personnel of the company could change every few years yet the business could go on indefinitely upon the reputation earned by the company. A geographical name can be adopted to show the extent of the company's operations as to territory, as the Southern Construction Company, but this is seldom the case. These names seldom indicate the limit of territory or other operations. Such a name as the Foundation Company does show the limit in scope of operation or classes of work done. Such names are all right if only that particular class of work is to be done, but few companies starting out with such intentions stick by them, within a few years being engaged in a number of different kinds of work. The name acts as a detriment to their business. In one case a company placed the word filtration in their title meaning to follow that special line, yet they took a contract for building a railroad tunnel. Others starting in the placing of foundations quickly branched out into other lines. Their names have thus become confusing to their clients.

If a company, such as a dredging concern, confines its work entirely to dredging there can be no real objection to this word in their name, but many of them undertake other work, and go anywhere to do it.

A long or a very elaborate name is to some extent a handicap in business. Most correspondents get the name wrong and in printing stationery and forms such a name makes the work more expensive. Lettering and names on machinery is likewise more expensive to keep up. Thus a fairly short impersonal name is the one that is

best suited to contracting, as the Illinois Construction Company or the Acme Construction Company.

Incorporation Papers.

A stock company can be incorporated in any state in the Union, or in any province in the Dominion of Canada, although it is possible, but seldom necessary to take out national incorporation papers by an act of congress or the Dominion Parliament.

Each state or province has laws of its own governing such incorporation. In some cases the incorporators must be local residents and maintain an office in the state. Under other laws this is not compulsory. When it is, dummy incorporators are used and these step out when the regular directors and officers are elected. An incorporating company, one drawing up and obtaining incorporating papers, will for a fee allow its office to be used for this purpose and will attend to the filing of yearly reports.

There was once a great difference in the laws of various states regarding incorporating stock companies, and those having loose and lenient laws did a land office business, but this has been rectified, and some states refuse to allow a home company to incorporate in another state and do business at home. Nearly all states require a company chartered in another state to register in order to do business in the new state.

It is all of these things that make it necessary for an attorney to attend to drawing up incorporation papers and seeing that they are properly registered and recorded. The law must be conformed to and if an illegal act is done the stockholders and directors can be held personally responsible.

It is necessary for the individual to know certain things and it is also possible for him to make certain recommendations and suggestions to the attorney. A company can only transact such business as is set forth in its charter, and for certain lines of business, such as banking and some others, a special charter must be obtained. Thus in drawing up incorporation papers for a construction company there should be included in the charter the right to engage in contracting, to own machinery, to manufacture and sell it and other articles, to own land, and the right to buy and sell it, to own and operate mines and quarries, and clay and sand pits,

besides manufacturing brick, to own timber land, and own and operate saw mills and pipe and tile factories and, in fact, to engage in all lines of general business for which a special charter is not needed under the law.

Outside of the name, the next most important item is the capital stock. If the stock is to be increased at any time over the amount named in the incorporation papers, the charter must be amended or a new one taken out. To prevent this, it is customary to name a larger amount than that wanted at the start, and the last named amount is stated as the capital to be paid in. This covers the law and gives a reserve of stock, generally known as treasury stock, to be used later. Under most laws five incorporators are necessary.

By-Laws.

The incorporation papers must be drawn up properly and an attorney can see to this, but with the by-laws it is different; the attorney may know but little of how the company will be managed or should be. In some states it is necessary to make the by-laws a part of the incorporation papers and in other states it is not. By-laws can be purchased, all printed, in stock books, but these are not adapted to construction work.

The by-laws should be written with great care. They should be explicit and cover details and not deal with generalities. The duties of each officer should be set forth and the proper procedure given for all the important details of management. This will prevent friction between the various officers and mean the saving of much money. Better than commenting on such laws, a set is given for use. As shown the by-laws are divided into articles and sections.

The by-laws are presented in full in Appendix A.

These by-laws are written at some length but they cover all points that may arise in the management of a construction company. They can be used for large operations or small, it being only necessary to make changes as to numbers and some details, and to curtail the number of officers by combining them. Thus one or two men can fill all the positions, or there can be a dozen or more.

Officers.

The organization of a company into various departments, showing the duties of each department and the various officers

has been clearly set forth in Chapter V, Volume I, pages 81-90, and the organization outlined in that chapter was based upon the set of by-laws listed. It is based upon years of experience in contracting and is the logical arrangement, having proved successful wherever tried. For a large company the work and responsibility is distributed among the directors and officers, the two most important of which are the general manager and the chairman of the finance committee.

Seal of the Corporation.

Nearly all incorporated companies use a seal. In some states a company can be chartered with or without a seal. With a seal, it must be affixed to most legal papers, as stocks and bonds issued and contracts and agreements. In affixing the seal, it is generally customary for the secretary to attest to the instrument by signing his name. These features have been covered in the by-laws.

Capital.

The amount of capital stipulated as being paid in must be paid or, in lieu of it, something of value, as machinery or services performed. If actual cash is not paid, then the other transaction must be made according to law and duly recorded in the records of the company. For instance, it is decided that a man shall be given \$2,500 worth of stock for a small steam shovel. Motion to this effect is made at a directors' or stockholders' meeting, the latter preferred, and a committee appointed to value the shovel and close the transaction. This committee performs its task and reports that in lieu of cash the shovel is accepted by the company for its value in stock. This is passed upon by the meeting and duly recorded by the secretary. If this is not done and the company fails, the stockholders or directors can be held personally liable for the amount of stock disposed of in this manner.

The excess of stock called for in the charter over the amount to be paid in, can be held as treasury stock and be disposed of for cash or other valuable consideration as the stockholders and directors may from time to time decide. Thus as the business grows and expands and there is a demand for more capital it can be raised through this stock.

Working Capital and Surplus.

As a company earns money from profits on different jobs, it is good policy to reserve some of these earnings in a surplus fund or as additional capital. The various stockholders having salaried positions in the company, draw down their salaries weekly or monthly and besides will receive dividends half-yearly or yearly as these are declared by the board of directors. Thus they are well paid and it is only proper that some of the earnings should go back into the treasury to expand the business and enhance the value of the stock. This working capital should be a reserve, and should be used only at the direction of the finance committee and the board of directors. It can be built up in the course of years to make it larger than the original capital. It can be divided into three amounts if desired, each meant for a different purpose. Thus the depreciation figured on the plant for each year can be set apart as a sinking fund to be used in buying new machines. Another fund can be set aside as a surplus or undivided profits to be used for declaring dividends in case money earned is tied up in retained percentages or if an unprofitable job is obtained, and the directors do not care to pass by a dividend when the stockholders are expecting one to be declared. The third sum can be used to expand the business, taking on new jobs and starting them, and other necessary expenditures that may arise. This money can again be replaced as the new jobs are put on a paying basis.

Stock Books.

For every incorporated company there should be a set of stock record books. These books show the amount of stock issued. They also show transfer of stock as sales are made from one stockholder to another. The records are kept by the secretary of the company and stockholders trading in stock advise him of their transactions. If new stock is to be issued for old, the old certificates are surrendered, either canceled or destroyed and new certificates are issued, the proper records being made in the stock books. It is from the stock books that the officers know who is entitled to vote at the stockholders' meetings and the number of votes each man can cast. For this purpose the stock books are closed on a date previously set, before each stockholders' meeting, so that any trans-

fers of stock made between the date set for closing the books and the meeting are not acknowledged and the representation and votes go to the old holder of the stock. As false entries can be made in these books, they should be guarded with great care.

Shares of Stock.

The amount of a share of stock is more or less optional with those who organize the company. Shares of stock are seldom made for less than \$1 or for more than \$1,000. The most common amount is \$100, although they are frequently set for \$10, \$25 and \$50. If stock is to be sold to the public in a small way, then shares are made small, as from \$1 up to \$10, while if they are to be sold in larger amounts they are made for amounts ranging from \$25 to \$100. Bonds are frequently made for \$1,000, but shares of stock are not often made that high.

Various practices obtain in issuing certificates of stock. A single certificate is sometimes issued for a man's entire holdings of stock. In other cases certificates are for 100 shares or for 10 shares, and at times a certificate for each share. When names are not placed on the certificates and the shares are to be sold broadcast, it is customary to issue certificates for each share, but as this is seldom the case with construction companies, it is the practice to issue certificates for small blocks of stock, as 10 or 25. Thus a block can be transferred without making out more new certificates for each block. Certificates for odd numbers of shares can be made up separately.

In starting a new company, if all of a man's subscription is not paid into the treasury at one time, a receipt can be issued to him for the money so paid in, in the various installments, until the stock certificates can be made out and delivered to him. A greater amount of stock than that provided for in the charter cannot be issued. If a man signs a subscription for a block of stock and later refuses to pay for it, he can be sued in the name of other stockholders or the corporation and be compelled to pay, so if a man does refuse to pay the amount of his subscription, it is well to make out his certificates of stock and tender them to him in the presence of witnesses, demanding the money for the stock, and upon his refusal a suit can be brought.

Stockholders' Meeting.

Meetings of stockholders should be held at least once a year, and as soon as the meeting is called to order, the first requisite is to see if all those present have a right to sit in the meeting, either by being actual holders of stock or having the properly prepared proxies to represent stockholders. For this purpose the stock books must be consulted, and the records as there shown must be the basis of the right to sit in the meeting and vote. Stockholders' meetings are only meant to receive the reports of the officers and directors, to elect new directors and to pass upon the general policies of the company, or to decide upon the issue of new stock or the creation of bonded indebtedness. Stockholders cannot usurp the functions and duties of directors and officials as outlined in the by-laws. At special meetings they can transact only the business for which the meeting is called and which is specified in the call. Stockholders can pool their interests and vote as a unit, or the whole or part of the stock can be pooled or combined and placed in the hands of trustees for a given number of years and trustees elected to represent the combination, they having the right to vote as per instructions or at their own discretion. This is sometimes done in order to control the policy of the company for a term of years. In a matter of this kind a deed of trust is made and recorded. The stock can be sold, but the right to vote the stock remains with the trustees.

Directors' Meetings.

The actual management of the company and the transaction of the company's business is carried on by the directors, who have more power than the stockholders. In most cases directors are stockholders, but this is not necessary. Directors elect their own officers and those of the company. They can also elect an executive committee and turn the management of the company over to it. They can bring such matters before the attention of the stockholders as they see fit.

The directors should have frequent meetings so as to keep a close supervision over the business of the company. The directors are seldom paid salaries, but it is proper to pay a fee for attendance and traveling expenses. If five dollars or more is paid as a

fee it is customary to pay it in gold, making the payment a sort of memento of the occasion. Directors cannot draw out money from the company or borrow from it, the other directors making themselves personally liable if they allow it.

Responsibility of Directors and Officers.

The directors and officers can be held responsible by the stockholders for everything that is done in regard to the company's affairs. The directors are only individually responsible if they perform illegal acts, but the tendency today is to make directors accountable for the juggling of stocks and bonded indebtedness of their company and to hold them liable for the extravagant management of a piece of property. This is being brought about by a clamor of the public, and courts to some extent reflect the sentiment of the public. Due to this same feeling, laws are being enacted making directors personally liable for certain acts and allowing criminal proceedings to be instituted against them. This allows creditors to take action against directors and officials as well as the stockholders. This shows the need of the constant advice of an attorney trained in corporation law.

Legal Aspects.

These things and some others to be considered show the legal aspects of managing a corporation in the twentieth century. Some years ago a chartered company was more or less a law unto itself, for it was possible to do every act that the law allowed an individual to do, and many things that an individual could not do; but this is changed, and there are many laws regarding corporations. The popular feeling against corporations causes these laws to be rigidly enforced. Thus there must be a guiding hand for a corporation and this shows the need of a general counsel as provided in the set of by-laws given in Appendix A. He can deal with all the legal aspects.

Registration in Home States.

Besides recording the incorporation papers with the secretary of state, or some other official in the home state, it is sometimes necessary to have the company registered in the home county, and

also in other counties in the state in which business may be done. Besides fines being imposed for not registering, certain legal rights may be affected by not complying to the law, and in some cases the directors make themselves personally liable for the indebtedness of the company.

In Foreign States and Countries.

An incorporated company in going into a state other than the one from which it derives its charter, to do business, is considered in those states as a foreign company. Thus these states are foreign to the company. To do business in these states, the laws governing corporations must be complied with, and one law now in vogue in most states requires that these companies must be registered with the proper state official. This registration makes it to some extent a local corporation and allows it to be sued in the state courts and the company becomes amenable to the state laws.

A company going into a foreign country to carry on construction must likewise conform to the laws of that country, and, in some cases, it is considered advisable to re-charter a company in that country. This is frequently done when contractors from the United States go into Canada to do work. A Canadian charter is obtained and the company or subsidiary company formed becomes a local corporation. These features of a stock company must be kept in mind.

Income and Tax Reports.

One objection advanced by many against doing business as an incorporated company is that the taxation is much heavier than when the business is conducted as a partnership or under the name of an individual. Thus a tax must be paid to the state upon the capital as well as the property of the company. Also a tax must be paid upon the net income unless it is less than a given sum. Another objection is that much of the business of the company must become public through the various reports that must be made to the state and national government. Few people take the pains to look up such reports, and a reasonable amount of publicity is not a bad thing for any company.

Taxations upon corporations are high and the tendency is to increase them. It is another way in which the public pays an

indirect tax, which is popular in America. A corporation's property, both real and personal, is taxed just as with any individual. This tax is assessed and paid in the usual manner.

The other state taxes are paid on the capital. For a new company the tax is fixed at a high figure and the company is given an opportunity of having it revised, setting forth the various assets of the company as: cash capital subscribed; value of patent rights, copyrights, trademarks, good will and franchises taken in payment of capital stock; real estate, machinery and plant, goods, wares and merchandise; tangible personal property; cash on hand and in bank; debts due from solvent debtors and shares of stock of other corporations. From these assets can be listed items exempt from taxation, as non-taxable bonds and mortgages, real estate and personal property already taxed, capital stock owned of other companies already taxed, patent rights, copyrights, good will, etc., taken in lieu of cash., surplus and working capital exempt by law, real and personal property in other states and other assets exempt by law. The resultant difference gives the sum to be taxed. In addition to this some states assess a tax based on the capital stock employed, while other states exempt certain kinds of corporations from taxation, based upon the kind of business and the amount of the capital stock invested in property in the state.

The national government also lays an income tax upon corporations and individuals having a net income in excess of \$3,000 per annum. Yearly returns setting forth the income, gross and net, and how derived, must be made to the collector of customs for the district, by a certain date. If such returns are not made a 50 per cent increase in the tax is exacted by law and a corporation can be further penalized up to the sum of \$10,000. The returns must be made if the net income is \$3,000 or more whether it is taxable or not, for there are certain exemptions made, and as in the state, the law allows some deductions.

Such a list of taxes seems very formidable to the layman, and unless experienced in such matters he will hardly be able to handle them. These reports should be handled by a lawyer. Some attorneys specialize in making out such reports and make a yearly charge for services. If it is not possible for the company's regular attorney to make them, or for the secretary, with the assistance and advice of the attorney, then special attorneys should be employed.

Other Features.

These are the main features of the organization of a construction company. Although there are disadvantages and objectionable features, yet there are many advantages over a partnership. For contracting, the most satisfactory way is to carry it on as an individual; but if partners must be obtained, in order to provide a larger capital, then a corporation is to be preferred to a partnership. A member cannot squander away his partner's property, cannot pledge it for a gambling debt, place a mortgage on it, nor commit the company to a ruinous policy. The by-laws set forth the powers of each officer and he cannot exceed those powers. By attesting to agreements and legal papers and by countersigning vouchers and checks, one man by himself is prevented from acting for the company. It is the safest way for two or more men to do business together.

CHAPTER IX.

LINES OF CONTRACTING AND SPECIALIZATION.

THE field of contracting is a diversified one, including a general line of many different kinds of construction and also specialization by many contractors. At one time the distinction was sharply drawn, but the tendency at present is to bring all into one general field.

Different Kinds of Contracting.

Thus we have many kinds of contractors—those that actually undertake construction and those that do only some parts of the work. This is not including engineers who do engineering work by contract; that is, engineers bidding against one another in order to get a job, calling themselves either consulting or contracting engineers. Unfortunately contractors are at times called upon to help these engineers so that they can either make both ends meet or make an extra profit by furnishing intelligent workmen to drive stakes, act as rodmen or tapemen, and assume other expenses that are by rights either those of the owner or the engineer. Then, too, the so-called consulting engineers, as soon as they get a job and get it started, are likely to place a young, inexperienced man on the job at a small salary, and get busy themselves in trying to obtain new jobs. The resident engineer is little more than a stake giver and the contractor's work must suffer, while he is telegraphing over the country trying to locate the engineer and get him on the job to render a decision on an important question that has arisen. This, though, from the standpoint of this book, is not contracting, only being mentioned as an evil that contractors must endure.

Besides construction work, there is contracting in furnishing teams to contractors and these men are known as hauling and team contractors. Other companies operate quarries and sand pits

and thus enter the contracting field. Then some companies dredge for sand and gravel and furnish these things to contractors. Then there are labor contractors, furnishing workmen by contract. These men are all known as contractors or contracting agents, but this treatise is meant to cover actual construction, and the two great divisions of the field are achitectural and engineering contracting.

In Volume I, page 55, the distinction between these two great classes of contracting has been touched upon. In the first class the contractor comes directly under the supervision and the direction of an architect and in the other he works under an engineer. Engineers are also engaged in architectural work, especially on steel and concrete buildings, but when so employed they, too, work under or through the architect of the building, or they are employed directly by the architect. In most cases the architectural contractor sub-lets the engineering construction to a firm specializing in that line, but the distinction is not so closely drawn as formerly and we find firms or construction companies doing both architectural and engineering contracting. The principles of contracting as laid down in this treatise are applicable to both fields.

Starting Contracting.

On pages 2 and 3 of Volume I some remarks are made as to the training of men starting into contracting and how to accomplish the results desired. It is not possible to give advice in such matters in a general way, as the advice must be specific and meant for each individual. The author believes that the contracting field offers wonderful opportunities not only to make a living but also to amass a competence. There are risks in it, but it pays much better than do most salaried positions, and most engineers can make a much better living at contracting than they can at engineering. Even if the engineer does not continue at contracting, the knowledge he gains while following that profession will make him a more competent engineer and cause him to deal with contractors on a fairer basis.

Contracting is a wonderfully fascinating profession. It deals with men, business methods, with engineering and the creation of structures. It is exceedingly broadening and it is a profession for any man to be proud of, for it is a profession of achievements.

To be certain of success a man must have some previous training and some capital. In starting he must choose the method and the line he wishes to follow. A friend may furnish him with a contract or a sub contract, but his success is dependent upon himself. In making his decision he must be guided by many things and some of them are given consideration in this chapter.

The main thing is not to attempt too much at first. It is better to accomplish something small and make a success of it than to fail in a large undertaking. The main idea is to keep one's eyes open and learn from experience, not only one's own, but also those of other people. It is rather strange that few people are willing to profit from another man's experience. It is generally necessary for a man to go through a thing himself before he will acknowledge failure.

General Contracting.

The term "general contractor" has two distinct meanings. The one in most common use is that of denoting that a contractor will undertake any kind of construction job, that is, that his field for work is not limited. He is not a specialist in any particular kind of construction, but feels he is familiar enough with all to contract for any job that he can obtain. Many contractors starting into contracting and many of those doing limited operations use the term "General Contractor" on their letter heads. They feel by so doing that it is easier to obtain work, although some of these now add the term, "concrete a specialty." This is done for the reason that so many concrete structures are now built, but the contractor still takes other kinds of work.

As a rule, after some years, when a man's business has expanded, the word "general" is dropped and only the word "contractor" is retained, as this is ample to denote that any kind of a construction contract will be undertaken, and is considered by many as being more dignified. If a contractor specializes, the kinds of work undertaken are given in his advertisements or on his letterhead, although some contractors use a prefix to denote their specialization, as "Railroad Contractor," "Sewer Contractor" and similar terms.

The second meaning of the term "general contractor" denotes a contractor who undertakes a job of some magnitude or one embracing a number of different kinds of work, and either sublets parts or all of it to other contractors. Thus a builder signs a contract

for the erection of a building and sublets the excavation, the foundation work, the brick-laying, the carpenter work, the metal work, the roofing, the plumbing, the electrical fixtures, the painting and every class of work in order to make a completed structure. Each sub-contractor is a specialist in his line and he works for the general contractor. The general contractor may, by his own forces, do some of the work, only subletting certain parts or kinds of work that he is not skilled in or for which it is difficult to obtain trained men. The same thing is done on railroads, canals, sewers, reservoirs and, in fact, nearly all kinds of construction.

Thus the term "general contractor" is used to differentiate between the man or company responsible for the entire job and the sub-contractors. This term "general contractor" denoting this, is not used on letterheads or as an advertisement as it is not considered good form so to use it. In some cases contractors feel that it is necessary to show on their letterheads that they have the general contract for an important undertaking and when this is the case, under the firm's name or company's title there appears "Contractors for Quincy Extension of the R. S. & T. Railroad." Such letterheads are used exclusively for correspondence pertaining to this particular job. This prevents a sub-contractor from claiming that he is the contractor for the entire job in order to advertise himself or obtain credit in buying goods. The last use of the term "general contractor" is to be preferred to the first use.

Sub-Contractors.

The idea of sub-contracting is discussed in Volume I, pages 8-12, showing its advantages and disadvantages, and elsewhere the form of contract to be used between the general contractor and the sub-contractors is covered, so under this head it is now desired to show how sub-contractors should be treated and handled.

A large number of general contractors after subletting their work seem to think that they have little to do with their sub-contractors except to pay them their monthly estimate and occasionally to visit their jobs. The making of a contract does not mean that it will be performed properly or performed at all. Although some sub-contractors are responsible, some are not and just as the owner and his engineer must give supervision to the job, so must the general contractor. Thus the sub-contractors must be given super-

vision and they must be handled in a manner similar to the contractor's own superintendents, and in addition some of them must be given assistance in a financial way.

In most cases the general contractor is a man of broader experience and at times of greater ability than his sub-contractor, Thus his advice and possible suggestions as to methods of carrying on the work may be of great assistance both to himself and his sub-contractors, for his success is bound up in their success.

With this idea in view, the general contractor or his engineer, in beginning a new job, should visit the sub-contractors and consult with them as to their work. Go over all the plans, drawings, profiles and the specifications and see that the sub-contractors understand these things. Take up with them the plant and tools they expect to use. The sub-contractor may not be in a position to cover his work properly with outfit either to complete the job on time, or to handle it at a profit. If this it is the case the general contractor may be able to rent or sell some plant to the sub-contractor or render financial aid so the latter can purchase it. The sub-contractor may have the wrong idea as to the methods of using his plant and in this he can be given advice and saved from making mistakes that would be costly.

The question of the forces to be worked should be taken up and discussed, for a job cannot be handled economically if it is short of workmen or has too many men employed on it. The placing of the forces also has an important bearing on the success of the job and on the speed of carrying on the work. It is advisable to take up the arrangements for securing the necessary workmen. It may seem to some that these are matters more or less personal to the sub-contractor and they are, yet these same things affect the general contractor, who is likely to lose money if the sub-contractor fails on his part of the job. These matters can be taken up and discussed with the sub-contractor without giving offense to him and without intruding on his prerogatives.

These are the items of importance to take up at the start and from time to time, possibly each month or even each week, some of the same matters must be gone over, especially if the sub-contractor is not making satisfactory progress or if he is not handling his work economically. This makes it necessary for the general contractor or his general manager or engineer to visit the job

frequently and keep in touch with each sub-contractor's work. Thus they will be cognizant of all that is being done by each sub-contractor, and this is a necessity for the good of all concerned.

For work in or near towns and cities, when the contractor furnishes all the materials and the sub-contractor places them, then this may be all that the general contractor may be called upon to do, but on larger jobs in the country, where large amounts of materials and supplies have to be purchased, the general contractor has an opportunity to render greater assistance to the sub-contractors and at the same time make extra money for both.

The financial standing and the credit of many sub-contractors is indifferent, while that of most general contractors is good. Thus the general contractor is in a position to buy materials and supplies much cheaper than his sub-contractors. He can purchase these things and resell them to his "subs" at a profit and frequently save them money. Most of this business can be done on a 10 per cent increase on his own invoice prices. This will not net a 10 per cent profit, as the general contractor will have some expenses to pay out of this 10 per cent, but on a large job a handsome profit can be made on the materials and supplies.

On some of the heavy materials such as cement, it is not always possible to charge a 10 per cent increase, but the general contractor can charge 5 or 10 cents extra on each barrel. The sub-contractor pays the freight, and handles and stores the cement, so that the only expense the general contractor is put to is the cost of stationery, postage and clerk hire in ordering, paying the bills and doing the necessary bookkeeping. Thus on a job where 10,000 barrels are used at 5 cents a barrel, the contractor makes a net profit of nearly \$500. This profit would go to some dealer, if it is not made by the general contractor. In one case a general contractor sold a sub-contractor his cement at a profit of 10 cents a barrel, which was lower by 10 cents than any price the same sub-contractor could secure from any dealer's or manufacturer's agent. Thus the general contractor made \$1,000 on 10,000 barrels and the sub-contractor was saved \$1,000.

Other materials and also machinery can be sold to sub-contractors by naming flat prices to them. The general contractor can discount his bills in buying such things by adding to his profit on them, and in some cases he can have himself appointed a manufac-

turer's agent in a locality where there is not a regular agent, thus getting a jobber's price on the machines. As the margin on such items is fairly large the contractor can cut the ordinary price, unless the manufacturer sets the selling price, thus making a profit and saving the sub-contractor money. Where the price is set by the maker the sub-contractor is no worse off.

Supplies and merchandise for commissaries and groceries and foodstuffs for feeding men must be handled on a different basis. The general contractor erects a warehouse or warehouses at convenient points, as a base of supplies, also magazines for explosives, and sheds for storing hay and grain, and sells to the sub-contractors from these. One man, as a rule, can attend to one set of warehouses, and where thousands of dollars' worth of goods are sold each month, the salary paid the warehouseman is a small per cent of the profit made.

These goods are the ones sold on the 10 per cent basis, the freight being added to the cost. The sub-contractors do their own hauling, the prices named being at the warehouse.

One advantage the general contractor has over merchants in selling the sub-contractors is that he is sure of his pay unless he allows the sub-contractor to overbuy, as he deducts the bills from the sub-contractor's estimates. If close attention is given to the sub-contractor's work, the general contractor can know approximately the estimate being earned by the sub-contractors and can refuse to sell if they are not handling their work properly. If the general contractor refuses to sell a sub-contractor, the latter is not likely to be able to buy elsewhere, so he must come to the general contractor for aid, and do as the contractor suggests both as to running the sub-contract and also in buying. This may prevent the sub-contractor from causing his own ruin and throwing extra expense on the general contractor.

In selling sub-contractors, the general contractor can assist the former in many ways. He can furnish tools and machines and allow the sub-contractor to make small monthly payments, or take a mortgage on the plant and allow him to pay for it out of the retained percentage, when it becomes due.

Sub-contractors can be assisted in meeting their payrolls by the general contractor. With estimates paid only once a month and pay-rolls weekly or semi-monthly, sub-contractors may have trouble

in paying their men, with the result that workmen leave and the job is short-handed and lags. Knowing the estimates the sub-contractor is earning, the contractor is safe in advancing a certain amount of money. For this he can charge the sub-contractor interest at an agreed rate. Some contractors advance money, charging interest at a high rate, and others without interest.

It is not a hardship to charge interest, for no one can borrow money without paying interest, but it is wrong to charge exorbitant rates, or usurer's prices.

A better way of advancing money is by a demand note on the contractor in favor of some bank, and have the general contractor to accept it over the face of the note. Such a note would read:

To George Smith & Co. Thirty days from date pay to the First National Bank or order the sum of three hundred dollars and charge to my account. Value received.

JOHN JONES.

Date Jan. 1, 1915, at Saco, Maine.

George Smith & Co. write across the face of this: "Accepted Jan. 1, 1915, George Smith & Co., by George Smith, President." If previous arrangements have been made with the bank this note is discounted at bank's interest rate and the sub-contractor has cash that cost him but little and the general contractor is not using up his own funds. The acceptance is made to fall due when the sub-contractor's estimate is to be paid and when the money is paid to the bank it is deducted from the amount due on the current estimate. Banks when they are secured are glad to do this kind of business.

Another way of assisting sub-contractors is to see that the engineer classifies and estimates the work properly. Sometimes engineers are careless in taking up estimates and overlook some item. Then, some young engineers defer their classifications of work until towards the end of a job. This may make the monthly estimate of a sub-contractor short, and he frequently needs his money as rapidly as he earns it. The sub-contractor is almost powerless to act in such matters, but the engineers will listen to the general contractor. It is the place of the general contractor without injuring himself to fight the battles of his sub-contractors, and if he does so, the sub-contractors will give him loyal support.

It is sometimes said that sub-contractors will not buy from their

general contractors and there is a tendency on the part of many not to do so. This can be overcome by offering fair prices to them on the things they must buy and treating them honestly in their accounts. Few men will buy elsewhere and pay higher prices just in order to feel independent of their general contractor. The basis of selling to them can be put in their contracts and a clause added in which they agree to buy from the general contractor, at the same prices that can be obtained elsewhere.

Too frequently we hear the remark, "He won't let his sub-contractors make money." No man in the contracting business can make a greater mistake than this. Upon the success of the sub-contractors depends the success of the general contractor. The latter may make a profit, even if his "subs" lose money, but the contractor cannot make all the money possible unless his sub-contractors are likewise making money.

Their interests are more or less identical. If the yardage or the amount of work is increased or the classification raised for the sub-contractor, the general contractor is benefited. It is almost impossible to increase the sub-contractor's profits without making those of the general contractor larger. And so it should be really a selfish motive that prompts a contractor to assist his sub-contractors. The latter's appeals to the engineers should have the cordial support of the former.

Instead of this, many contractors prevent engineers from assisting sub-contractors. The author has seen this in his own experience. One case in particular stands out, where a chief engineer cut out of an estimate more than 600 cubic yards of solid rock that was rightly estimated by his assistant, and when this matter was taken up with the chief engineer the general contractor talked against it, thus robbing the sub-contractor of money earned, and taking from his own profits about \$75.00. Many examples of this kind could be cited.

A general contractor should always bear in mind that all the rights of a sub-contractor originate with him, and so all appeals for rights and favors must be made through the general contractor. If the only means of transmission is hindered, what is to become of the sub-contractor?

He will be injured and will thus injure the general contractor. This may mean bankruptcy for the sub-contractor, and if he fails

before his job is finished, then the general contractor must either relet the work or else finish it himself, both of which may be expensive. Naturally, if a man fails on a contract, the work is in bad shape, and it often costs much more than the original price to put the job in good shape and finish it. For these reasons it is necessary for a general contractor to support a sub-contractor in every way possible.

Parent Companies and Subsidiary Companies.

It is with these ideas in view that many large contractors organize subsidiary companies in carrying on large construction jobs. Thus a man can obtain a very large piece of construction, say a stretch of railroad 100 miles long. He himself has four or five subsidiary companies. He divides up the work between these companies, and thus has a partner with money interest in charge of each section. These partners are able to sublet parts of their sections and look after their own sub-contractors. Thus the general contractor has only to give general supervision to the job, depending upon his partners in the subsidiary companies to keep things going along properly.

Another use of such companies is for a single contractor to take jobs scattered over a widely scattered area and thus place one of his own companies on each job. He is thus able to tell the owner and his engineer that he will not sublet his work, but will have his own company to do it. This is sometimes a telling card, especially with people who object to sub-contractors.

An organization of this kind could be organized either as firms or as stock companies, the general contractor owning either half or a controlling interest in each subsidiary company. The general company can be known as Smith & Company, or the Smith Construction Company and the subsidiary companies as Smith & Jones, the Smith & Brown Company and so on through as many as one man can control. Another way is to let the subsidiary company be known under the partner's name as Jones & Company. This is sometimes done so that the interest of the larger contractor in the company can be hid, thus submitting two bids on a job, or to prevent it being known that the general contractor is subletting work to himself; but reasons like this do not occur often, and competitors learn the actual facts and use them against these contractors.

Another need of subsidiary companies is to engage in a general line of work and then have other companies specialize. This is becoming very common today. One large contracting firm doing a general business has a subsidiary company engaged in the concrete pile business. They also have a subsidiary company that owns all of their plant, furnishing such as they need to their different jobs. This plant company also sells and rents plant to any contractor. Both of these ideas are excellent for it allows a general contractor to bring onto his work his own companies that are specialists in certain lines, a valuable asset when it is necessary to show experience in certain difficult lines of contracting.

The idea of a subsidiary company to own a contractor's plant has some good features. It would mean, if a contractor lost money heavily on his job and his own company failed, that his plant would not be involved, and he might so realize on it as to get other jobs and keep at work. Naturally to have these assets as the property of another company may curtail the credit of the contractor's own company.

Two Companies Taking Contracts.

In many cases two construction companies may take a contract together. This may be done for several reasons. The job may be too large for either to handle by themselves, with their individual assets, or one man may have an idle plant, but has not time to look after the new job, which the other contractor can do using the idle plant. A third reason is that one contractor may not have had experience in the particular line of work and so takes an associate who has, thus between the two qualifying for the job.

Such a procedure is perfectly proper and often proves profitable, if the matter is done in a perfectly legal manner. A written agreement should always be made. In this, should be clearly set forth the assets that each contractor or company is to furnish, and the share of the profits that is to come to each. There should also be a clause setting forth for what per cent each may be called upon, to make up any deficit that may have to be met. Furthermore the agreement should provide who is to be in charge of the work and what each contractor is expected to do in regard to the management of the contract. Such an agreement will prevent disputes and the possible loss of money.

With stock companies, there is sometimes an exchange of stock

between the two companies which brings them into close association and allows work to be done jointly for any length of time desired.

Size of Contracts.

Construction jobs vary much in size and in some cases the size is the governing factor in letting the work. Thus an undertaking of magnitude is divided into various sections or contracts and let. The new water supply system for New York City from the Catskill mountains involves an expenditure of over \$160,000,000 and is divided into about 200 different contracts varying in amount from a few thousand dollars to about \$15,000,000. This alone shows how contracts range in size.

Many beginners and contractors with small capital stick to small jobs, those seldom amounting to more than \$10,000, but the amount of money involved does not, in a comparative sense, show the extent of a job, nor the amount of plant needed. Thus a \$20,000 drainage job may, in some sections of the country, be a large job for that class of work, while in another section a \$100,000 dollar job is not considered large. Then, too, a job for \$50,000 of railroad construction may take less plant than a \$25,000 job of highways.

Then another difference in jobs consists of the various classes of work that must be done. Thus one job may call for excavation only, making it a very simple one, although there may be thousands of yards to be moved. Other jobs, such as the building of an electric road, will include a dozen or more classes of work: excavation, the building of pile and timber bridges, the laying of pipe, the building of concrete structures and small station buildings, the laying of the track and producing of crushed stone for ballasting, the erection of poles and painting them, the stringing of wires, etc., the building of a power house and car barn and other work incidental to an electric road. The job may not exceed \$150,000, yet be more intricate than the one for excavation amounting to half a million dollars. One contractor who built electric roads and similar work called such jobs "big little contracts," and said he took only such contracts.

Jobs can be divided into about four classes: small, \$10,000 or less; medium, running from that figure to \$100,000; fair-sized contracts from that figure to half a million dollars, and large con-

tracts from that figure up to many millions. The magnitude of a job must be judged not only by the amount of money involved but also by the intricacies of the work and the plant needed for it. Thus a comparatively small job may mean the purchasing of more plant than the contractor has capital for, thus making it undesirable to a man who has to buy new plant, while another who already owns the plant may find it a profitable undertaking.

The only importance to be attached to the size of a contract is the plant and capital needed to run it. Unfortunately there has not been gathered such data as to figure, even approximately, the amount of capital and plant needed. This is to be regretted, as not only would such information be valuable to contractors and engineers, but also to manufacturers, who wish to know if they are selling all the plant possible, in their lines. Thus if a manufacturer divides the country up into sales districts and knows there have been let \$5,000,000 of work in one district, in lines for which he makes plant, what per cent of this can he figure as sales for his products? A solution of this would be helpful.

Contracting, Financing and Operating.

More and more contracting firms are going into the three lines of contracting, financing and operating engineering projects. To illustrate: A water power development is to be made, a dam and power house built, transmission lines and substations erected and the power thus generated sold. The construction company agrees with the holding company to furnish the capital needed, through the sale of bonds, to build the project and to find customers and operate it.

The money is generally obtained through banking connections of bond brokers who can handle such industrial bonds. The contracting company maintains at least three distinct departments: a financial department, a construction force and an operating department. This line of business has proven to be profitable to a number of companies, so much so that some of the leading companies engage only in such construction as they can either finance or operate. Now and then a company is formed especially to do this kind of work, but in most cases there is a gradual growth from contracting into financing and later into the field of operating.

Various Lines of Contracting.

The various lines of contracting are numerous. Almost any list is bound to be incomplete. In fact there is little need to name all of the many kinds of engineering and architectural construction, but it is possible to give a fairly complete list of certain lines of contracting that go to some extent together. The term "general contracting," takes in all of them, but some contractors confine themselves, except upon a few occasions, to certain lines, as street and road work, or street work and sidewalks, including sewers; others to railroads, including steam and electric, subways and tunnels; some to sewers and conduits and pipe lines; others to waterworks, including dams, reservoirs, aqueducts, pipe lines, filter plants and pumping stations. Then there are lines, such as any kind of a concrete structure; special lines of concrete, as monolithic and unit buildings, bridges, chimneys, tanks, pipes and other structures; steel structures, as tanks, gas receivers, bridges, and buildings. Buildings of all kinds make up another line. Drainage and land reclamation is done by some contractors, and dredging by others. Some confine their work to masonry, others to brick laying, some to shaft work, some to landscape gardening, some to grading and excavation. This last includes such work as levee building and dykes, canals and ditches for many purposes, cellars and foundations, grading and regrading town sites, race tracks and fortification, athletic fields and parks.

River improvements, revetments, dams, locks, wharves, piers, docks, dry docks and the building of new channels are lines of hydraulic work. Quarrying stone, digging sand and gravel are all done by contractors. In nearly all cases the training and experience gained in one line fits a contractor for another line, just as it does an engineer. Some engineers become specialists, but most of them go from one kind of work to another and thus become men of broad experience. This is necessary both to round out a man's experience and to keep employed. So it is with contractors. They must keep themselves employed.

When construction work is plentiful contractors have but little trouble in securing jobs, but when work is scarce then the obtaining of new work becomes a serious problem.

To be without work is an awkward position for a contractor, as he must face many difficulties. He may have an extensive plant

or outfit on his hands and without a new job to move it upon attention must be given to the care of valuable machinery and tools. If the outfit can be moved to a new job, the cost is no greater, under many conditions, than to send it to a storage yard. On the new job, all the machines that are not to be used can be cheaply stored and protected from the weather. But when these same things have to be moved to a storage yard the expense is much greater, as they must be loaded and unloaded twice before being placed upon a new job, and must be handled in the storage yard or house and be protected from the weather. The cost of these things comes at a time when a contractor can ill afford it. The only advantage gained is that the plant can be overhauled and put in first class shape for new work.

A contractor also faces the possibility of losing the good men in his organization when he is without jobs. The building up of a labor organization takes years. Good men are hard to obtain and if once let go they are very hard to get back, as other contractors will offer them inducements to stay in their employ. A good working labor organization, with competent superintendents and foremen takes years of culling out of indifferent men, to build it and make it an asset to a contractor.

Another factor against a contractor without a job is that he must live and maintain his office directly out of his capital, thus impairing it, and this may injure his credit. These facts cause a consideration of how to keep in work and the lines of contracting to follow.

Specialization.

The lines of work to follow have a bearing not only upon a contractor's keeping himself employed, but also upon his entire scope of operation and his ultimate success in the profession. Another factor brought into play in this connection is the amount of capital that a contractor can control. This must be a deciding element in the size and number of contracts undertaken. In Chapter III the subject of capital needed and the financing of contracts has been discussed.

A beginner or a man with limited capital will look for small jobs. Today, this will lead him to consider the concrete field, and there are many reasons for this. New uses are continually being found for concrete and thus this class of work is becoming

more plentiful. If only concrete structures are built the contractor at once becomes a specialist. The specialist has plenty of work in prosperous times, but is more than likely to be idle in hard times. Hard times, in fact, is a powerful lever for compelling all specialists to become general contractors.

To obtain some classes of work today it is almost necessary to be a specialist. This is true to a great extent in public contracts. A town or city has a reservoir to build and will award a contract only to a man who has had previous experience in constructing reservoirs. So it is with pipe lines, sewers, docks and many other classes of construction. Even private parties sometimes demand to know what work the contractor has previously done in the same line.

There are some few special lines of work in which past experience may be absolutely necessary, but they are few indeed. Some kinds of subaqueous work, the erection of steel and one or two other classes of construction, may need some previous training and experience, but most engineering construction can be done by any contractor of experience in the general lines.

For instance a reservoir contract may require the construction of a masonry dam and some earthen dykes, ripraped on one side and turfed or sodded on the other. Any contractor who has built railroads or other classes of structures in which excavating, placing earth and building masonry enters, will be competent to build a reservoir, especially a railroad contractor. He is experienced in foundation work for masonry. He has laid concrete and other classes of masonry and is accustomed to following specifications on all classes of work. He is experienced in laying rip rap and pipe. In fact, he has done everything that he must do except a few unimportant details clearly set forth in the specifications. Why should he not build just as good a job as a man who has built several reservoirs? If lack of experience is to prevent him from getting work, how is he to obtain his first job, so as to qualify for others? In many cases the engineer who insists that the contractor be experienced, lacks the same experience himself. This was the case on an important job let some years ago in New York City. Two out of three of the consulting engineers were devoid of experience in their work, yet insisted that the contractor be experienced in the class of work in question.

It is interesting to note the experience of some contracting

companies that have started out in special lines. One company began by specializing on foundations, but within a few years they began taking contracts for tunnels, bridges, shafts, dams, and, in fact, any difficult kind of construction.

Another eastern company began by laying waterpipe, then took on reservoirs, then aqueducts and finally almost any kind of work. Another large company made a specialty of building electric roads, but today they engage in almost all kinds of engineering and architectural construction. These are all large companies, and similar experiences have occurred with smaller companies and individuals. One man in the south started in the quarry business, first for crushed stone. The quarry, when developed, produced fine building stone, so he used the best for this purpose and the poor material for crushing. He found that in having contractors bid upon structures with a view of using his stone, they often failed to secure the jobs. Consequently he took to bidding himself and found that he could get work, making a profit on the job and keeping his quarry running with a full force. This took him into the building business. Then he began railroad construction, first only for the masonry, then the grading in connection with these structures, and later all the work of building railroads, subletting parts he did not wish to do himself. As the demand for better wagon roads came, and as he produced crushed stone, he began to take contracts for road work. Thus from a quarry operator he became a contractor engaged in general lines. A similar experience to this occurred with a company that started in the sand and gravel business. First they added street paving, then when concrete came into vogue they began building concrete structures. A few contracts for building concrete bulkheads for wharves and piers took this company into pile driving and foundation work.

Another company engaged in the lumber business bought a large tract of land upon which there were thousands of trees that would make excellent piles. In marketing these it was found that better prices could be obtained and quicker sales effected by taking contracts for wharves and bridges. A few pile drivers were bought or built and the lumber company was engaged in contracting.

Many contractors' supply companies have found it to their advantage to take contracts, and so at first engaged only in selling

to contractors, they have broadened out until all kinds of construction work is done. On the other hand some men engage in general contracting and then invent some special machinery or methods of doing work, or get control of some territory for certain patent rights and find it profitable to specialize in that line. This was the case with a contractor who took out patents on a concrete chimney and formed a company for building these structures only. No one can advise a man as to whether he should specialize or not in contracting. It is only possible to point out the advantages and disadvantages of specializing, tell of the experiences of others and let each man decide these things for himself.

The man carrying on limited operations will not in every case follow general lines, for some will specialize, but most, in order to keep themselves in work, will take any kind of a job that can be obtained. A beginner at contracting is more or less in the same position. He is looking for jobs and experience and the greater the variety the better he is likely to be suited. However, small contractors in the larger cities find it practical to specialize more than those in smaller communities and in the country.

It is possible for a large contracting corporation to specialize and at the same time do a general contracting business. This can be done either by subsidiary companies or by different departments. Both of these methods are used by some of our large operators. If the work is done by different companies, then each one covers only one or two classes of work, and in bidding on new jobs, stands to a great extent on its own record. This may be a disadvantage at times, as well as the fact that there is a duplication of expenses in salaries and overhead charges. Then it is not possible for one corporation to fall back upon the resources and men of the other companies as when all are in one organization. An advantage of different companies is that it is often possible to get capital in one operation that would refuse to be invested in a general company. Then, too, an able manager can be sold an interest in a subsidiary company and put in charge of their work, obtaining much better results than can be done with a man whose only interest is his salary.

With one large company and different departments, there is not a duplication of overhead charges or salaries and each department is an asset to all the other departments, as the experience and resources of each stands behind the corporation, in bidding

upon a job. The accounts of the company can be simplified and men and machinery can be changed from one department to the other as necessity demands. Each department can specialize. One can be for foundation work, another for concrete construction, one for building waterworks, one for railroads and so on through the long list. If work becomes scarce these departments can be consolidated and the best men in the different organizations retained. All the different departments center under one head, or general manager and chief engineer and president, but the work can be divided up so as to have different departments report to different officials, as first, second, third and fourth vice-president. The financial department, under the treasurer and finance committee keeps the accounts and handles all the money for all the different construction departments.

Such an organization can undertake the contract for a vast piece of construction, consisting of a variety of work. For instance, a water development on a large river is to be made. A dam is to be built, large power station erected, some manufacturing plants built, a town laid out and a railroad constructed from a main line to the new town. The work can be carried on in the following manner. The railroad department builds the new line, the dam is built by the foundation department, which also places the foundation for the power station and the factory building. The wagon road department clears the town site and grades the street. The waterworks department builds the water system, while the sewer department puts in the sewerage system. The building department builds the power station, the factory buildings and the houses in the town. The mechanical and electrical department places all machinery and the lighting system. There will be much work for the concrete department, and the bridges, coal trestles and material chutes and conveyors can be built by the bridge department. Structural steel will be erected by the steel department. Thus men trained to certain lines of work handle each as a special, yet the entire job is done by one company under one head. Such a contracting company if well balanced can become a great power in the construction world. It is possible through such an organization to carry on many jobs of magnitude at one time in any part of the world.

A small company organized along the same lines cannot hope to undertake many large jobs, but it can do a large number of dif-

ferent jobs at the same time under a similar system, and if managed well will soon grow to be a large company. The only thing necessary in the small company is to consolidate the positions of several officials into one so as to keep the overhead charges low.

In specializing at contracting, work can be done under two distinct headings. First as to the kinds of structures that are to be built, as buildings, railroads, wagon roads, sewers, etc., and second as to the class of materials used, as concrete, steel, wood working, excavation, etc. Both kinds of this specialization are followed. The first classification may bring in a variety of work to produce a structure and this is more generally followed than in working only in certain materials, with but a few exceptions, as in steel construction and concrete work, needing special knowledge. Excavation, however, calls for much heavy and special machinery today or else a large number of teams.

These three classes of work and a few others have many specialists in them, but in most cases specialization is followed along the line of the kinds of structures built, and many contractors either build only one kind of structure or include several in their schedules. Then, too, some contractors do work only in cities, while others do not care to operate except in the country sections, although this is not a true specialization.

Some contractors specialize as to accessories in the contracting field, and find the work very profitable, especially in the larger towns and cities, where there is enough work to make such a thing possible. One is owning teams and hiring them out, or doing hauling by contract. Many city contractors do not own any teams of their own and use hired teams exclusively. In some cities team contractors charge a flat price for carrying away excavated materials, disposing of the material as they see fit.

The furnishing of sand, gravel, crushed stone and other supplies is a profitable business, but it is not strictly contracting, although as previously explained this business often leads into the contracting field.

The collection of garbage and other wastes in our cities is one form of contracting as is also the clearing of streets, and the lighting of lamps, especially where gas is used.

Some contractors look for jobs by saving merchants and public corporations money, providing the capital for the work themselves and taking their pay from the annual savings effected for

their customers, such as installing sprinkler system in buildings and paying themselves from the money saved in fire insurance rates and in apparatus for handling goods and similar things.

These are all special lines, but as it is difficult to draw fine distinctions between some of them, so it is that contractors take up several lines closely connected and then broaden out and take in other lines, doing a very general line of work.

CHAPTER X.

THE STANDING OF CONTRACTORS.

THE public, engineers, and even some contractors do not understand the practical use of contractors and their economic position in the world, and the relation that does exist between contractors and the various people they serve. This chapter is written to help make this position clearer to all and, if possible, to suggest some remedies for existing evils.

Contractors in Bad Repute.

A mayor of an eastern city, in his inaugural address, recently stated: "I believe that all new street and sidewalk work should be carried out through the direct work of the street department and not let by contract."

This man was a business man and many business men seem to think that public work should not be let to contractors. This is to some extent due to the fact that in the past contractors on public work have been in ill repute. The public, through the newspapers and the politicians, has been led to believe that contractors have been and are still grafters.

Unfortunately there has been some basis in the past upon which to found such statements. In some cases the contractor has been at fault; in others he has been more sinned against than sinning. Some contractors have been grafters and also corruptors of public officials. Others have entered into the combinations to loot the public treasury. Some contractors have become the political bosses of their city or state and have made large fortunes dishonestly for themselves and their followers.

If fraud is to be practiced on the public there are many ways of doing it. One of the easiest methods is in connection with public improvements calling for the expenditure of thousands of dollars. Just as much money can be stolen when such work is done by the day labor method, but it is a little harder to conceal it than when stolen through contract work.

It has also been possible in letting public work, for contractors to keep out competition through the labor unions, when dishonest labor leaders have put themselves in a grafting position with dishonest contractors and politicians. This has been an injury to the public and also to the contracting profession.

Contractors have, by combining in making bids, where the competition has been limited, been able to parcel new construction out among themselves at exorbitant prices. Such facts have become known to the great injury of contractors in general. There have also been cases in which contractors have obtained valuable contracts by bribing public officials intrusted with awarding construction contracts.

Thus with the bad reputation of some contractors in the past, it has been an easy matter to maintain that, as the world does not change, contractors have not changed. In spite of this, the assertion can be made without fear of contradiction that although dishonest practices still exist in contracting and in some places contractors are parties to robbing the public, most contractors are honest and prefer to be honest, and further, that there is little graft in awarding and carrying out most public contracts.

However, the old impression still remains. We hear such public utterances as the one quoted, and in many towns and cities and also in state and national construction work, we see the contractor eliminated and the expensive day labor system used. This is an injury both to contractors and to the public.

This substitution of day labor methods is due to three reasons. One is the ignorance of executives in these matters. Well-meaning men, who know nothing of the past history of such things except through hearsay, know nothing of the problems of construction by the contract and day labor systems. There must be knowledge of such things in order to decide upon the proper procedure.

The second reason that some public officials advocate the elimination of contractors and wish to do construction and maintenance by the day labor method, is that they hope to build up a political machine with a large following. The positions of superintendents, clerks and foremen are given to ward heelers and close friends of the politicians and, through these, workmen who are given jobs are brought into line and votes are secured for the politician or those he wishes to run for office. This is a fraud perpetrated on the public.

A third reason for doing away with contractors and using the day labor system is that some engineers in charge of construction honestly believe that they can do work as cheaply as a contractor and can thus save the contractor's profits. Other engineers begin by believing this and then become puffed up with the authority thus obtained and with the fact that they are at the head of a large construction organization and thus continue this kind of work until stopped by higher authority.

When the country is prosperous and construction work is plentiful, contractors as a class hardly feel the effect of some jobs being done by day labor, for there is work enough for all. But let the times be hard and then the fact that some needed job is being done by day labor brings the fact of this detrimental practice home to contractors.

This makes it necessary that contractors, individually and through their organizations, should combat these conditions. The first thing necessary is to clean house and live down the past bad reputation of contractors on public work. Contractors can do this by being honest on all public work—honest in making up their estimates, honest in submitting proposals, and honest in carrying out their contracts. With this sort of honesty all concerned will soon get to know that contractors are as honest as the ordinary business man and the reputation of contractors will be enhanced thereby.

This is a great time for individuals and organizations to adopt codes of ethics. Firms and companies have adopted them and published them for their associates. The leading engineering associations are adopting codes of ethics. With these as an example, the various contractors' associations can adopt codes of ethics pertaining not only to public work, but also to private contracts, and can set penalties for those who break the codes. Men will do mean, dishonest tricks under many circumstances, but they hesitate—at least most men do—when they know they will be shunned by their associates and will be stamped as unworthy of the esteem and respect of their fellow citizens. Thus a premium is set upon being honest.

Their Relation to the Public.

Contractors and the public should be closely allied, especially as regards public work.

Contractors play an important part in the construction of public structures. It has been through them that many millions of dollars have been saved in the United States and Canada to the taxpayers, the public. This has been due to the fact that not only have the contractors done work better, but also much cheaper, than that done by the day labor method. For this reason there should be a close bond between contractors and the public, as the cheaper work is done, the smaller will be a citizen's taxes. This is also the case when better work is done, as if a structure serves its purpose longer, less money will have to be raised to maintain and renew it. This is especially true of road and street work. Thus the contractor is a real friend to the public, though hardly a philanthropist, for he in turn is paid for his work. If the contract system was done away with in America, taxes would undoubtedly be higher.

Unfortunately the ideal relations that should exist between contractors and the public do not exist, and contractors are looked upon, to a great extent, as grafters. This has been due to a number of causes.

First, contractors themselves have been to blame, not so much today, but in the past. It has been a prevalent idea in the past that public money was legitimate prey to anyone. The farmer felt that work on the country roads should be done by him, as in this way he worked out his tax, or got back part of the money he had so paid. He was not very zealous in doing his work. To stop and talk for half an hour did not worry him, as he felt he was partly his own boss, and it was not anyone's business if he did waste his time. The man working for a city is wasteful of materials and thinks nothing of loafing some, for he says, "The city is rich." Thus it was common not only for these people, but also for contractors to think the public treasury was there to be looted, and combinations and deals were made. This idea was wrong and the public has learned that it must suffer in consequence, so that today more is demanded of those who work for the public.

These things have caused the public to distrust contractors; to believe that they have made fabulous fortunes on public contracts, and the daily papers have added to this belief by publishing sensational articles and cartoons of contractors looting the public treasury.

A contractor is viewed by the public as being a sharp, shrewd

man living off the public, making exorbitant profits on his work and being the friend of public officials and politicians. Due to his supposed wealth the contractor is respected somewhat, and even held in awe, and the public is always interested in him and his doings. This was shown in the case of James B. McDonald, the contractor at the head of the company that built the first subway in New York. His name was known to nearly every man in the city. He was looked upon as a genius, as a multi-millionaire. The name of the engineer who planned and supervised the construction of the subways was hardly known to the public, and the financiers who backed the contractor and made his work possible were given scant notice. This contractor was an able man, but he only followed the engineer's plans and instructions and sub-contractors, many of whom were unknown to the public, did the actual construction. Mr. McDonald was not a wealthy man, and the greater part of the profits made on the subway were tied up in litigation and ultimately went to his backers. Yet his work placed him at the head of the contracting profession in New York city.

The public is always interested in contractors and their work. Citizens passing any construction job stop to watch the men and machines at work. They ask questions and marvel at the information given them. The public surrounds public construction with romantic ideas, and is pleased when the Sunday papers and magazines describe and illustrate large construction jobs. The working of powerful machinery is fascinating to man, woman and child, and, on public work, the contractor is laboring for the comfort and pleasure of each citizen. Thus contractors and the public should know one another better.

How is this to be done? In several ways. Let responsible employers and also contractors themselves give civil and explanatory answers to questions that are asked by onlookers. Explain to old and decrepit men, who visit the jobs daily in good weather, how and why the work is being done and the fact that "all is not gold that glitters," so that the contractor's supposed profits melt away in some cases before the job is finished, and these men will answer many of the questions put by the chance wayfarer.

Let contractors and their employees, as opportunity permits, make addresses before improvement associations and business and commercial organizations. If a job is large enough to justify the expense, the lecture or talk can be illustrated with lantern slides.

Even churches and religious societies will be pleased to have such addresses made before them.

The newspapers are glad to get stories of public improvements. Even when they have not room for many stories of one job, they are glad to publish good photographs of a job, from time to time, with an explanatory note under them. Through the publicity thus gained in the papers the contractor's side of public work can be made known to the public.

In these ways contractors can take the public into their confidence and both can get better acquainted. If contractors are to put a stop to the expensive day labor system of doing construction work, some steps of this kind must be taken. It is a fight for contractors and they must undertake it themselves.

Relation to Public Officials.

The relation of contractors to public officials, on public construction, is generally set forth in the local laws and in many cases in the contract for the job. This is the legal aspect of the matter, but there is also an ethical side to this important subject. In the past, and to some extent today, there has also been an illegal side to the relationship of contractors and public officials, that of bribery and the levying of blackmail, known today in common parlance as "grafting."

Such illegal practices should not exist. That they do exist, however, must be recognized. The contractor should know the general methods used in corrupt practices, so that he may guard against them. It was once a fairly common method to pay certain public officials or the political boss of the county, city or state, a sum of money to be awarded a contract, or to give an interest in the job to these officials. This was bribery. Another form of bribery was to pay certain officials for obtaining favorable estimates and for receiving promptly the money for work done.

These things are still done, but as the laws are plain as to those who are caught in such acts, the grafting has taken other forms. A contractor may be bidding upon a job and be the lowest bidder, or may have some work going on. He is solicited to make a cash subscription to the campaign expenses of the political party in power. If the contractor is doing business as a corporation, he is asked to make his donation as an individual. His donation is some

liberal per cent of his estimated profits or of the total sum of his contract. If he refuses, his bid may be rejected, or trouble is made about his work. Materials are not suitable, workmanship is bad, until the contractor is so harassed that he pays over the *voluntary* subscription. Such a subscription may appear in the list of campaign contributions and it may not. It is against the law in most states to solicit and pay over such money, especially for a corporation.

Some contracts provide that all machinery and materials to be used must be acceptable to a certain official. This man may be too busy to attend to such things promptly, so the contractor must hold up his work. He suggests that he will pay the expenses of a special deputy to inspect and pass upon the machinery and materials, the manufacturer being willing to pay part of this sum. With grafting officials this offer is accepted and the money is paid over. Then the contractor is advised that the deputy will not be on hand for some days but that he can go on with his work. Thus a manufacturer and a contractor find that small payments allow their products to be accepted and the work to go smoothly, and money is paid over at intervals to keep the "wheels of the government greased."

Then a contractor finds his estimates are not paid promptly. Some politician or public official can see that these matters are hastened and a fee for their services is not an unreasonable matter. This is blackmail and grafting. So other excuses are made to compel the contractor to pay out money. Some of this is returned to him in the form of payments for extra work, making the contractor not only a briber but also a receiver of stolen money. Many other practices obtain in these illegal transactions. Checks are seldom accepted, as they can be easily traced, so that only cash is used in such transactions.

Every contractor should post himself, through his attorney, as to the legal aspects of his relations with the various public officials. For instance, one official must sign the contract, another must affix the seal. The engineer or some other officer, such as the superintendent of public works, will have charge of the construction, while if trouble occurs someone else will have the power to annul the contract. Possibly another officer may have charge of making up the contractor's account and still another of paying him. These officials, according to law, after the contract is signed have no discretionary powers, except such as are set forth in the public laws

and the terms of the contract. Their duties must be performed, but it is seldom the part of wisdom for a contractor to try to compel public officials to do their duties against their will. There are too many ways in which public officials can do injury to contractors who incur their ill will.

This brings up the ethical side of this matter. A contractor must please public officials not only as to the character of the work that he does, but also as to the progress and the methods of carrying on his job. It is not necessary that a contractor be subservient to officials, this may injure him as much as being contentious.

The relation between contractors and public officials cannot be ideal, but each must understand the position of the other.

It must be remembered that politicians are quick to read the public and, if they are to continue in office, they must obtain and keep the good will of the public. Taxpayers like to see things going with a vim and push. They are interested in public work, so when they become impatient public officials reflect their impatience. Nothing brings so much trouble upon a contractor as being slow in starting a contract and then making but poor progress on the work. This is especially true of work within the limits of a city. Not only do the merchants find themselves inconvenienced, but public officials must stand for their complaints. Then too, every mayor or other elected officer wishes to point with pride to public improvements that have been planned and finished during his administration. Such an accomplishment may be the cause of his re-election. Delays may mean that the entire public is suffering for the want of the public improvement. Another feature that public officials must consider is that delays may mean that large interest charges are accruing, or that money is lying idle. Thus there is a real need that the contractor make satisfactory progress.

More disputes on public work arise over the progress being made on a job than over any other feature. Another important thing over which disputes arise is the ruling of inspectors. Few of these men are competent to pass upon questions that arise, and an ignorant or arbitrary inspector can cause much trouble both for his employer and for the contractor. All inspectors on public work should be engineers, but at present contractors must put up with those they find on the job.

As soon as there is any trouble regarding an inspector, a contractor should go at once to the engineer or other official in charge

and thus get his story to headquarters first, and ask for a ruling on the matter. This prevents the inspector from carrying in a perverted story. A record should also be kept of all rulings of an inspector so that each subject can be taken up with the engineer as occasion requires. This will fortify the contractor's position, should trouble occur over the inspector.

If public officials and contractors will try to place themselves in each other's positions and consider both sides of the question, then the relations of one to the other will be better understood and these relations will seldom be strained, preventing long drawn out disputes and lawsuits.

Relation to Private Parties.

Every contractor should strive to have close and friendly relationship to private parties that let contracts. Not only does the obtaining of such contracts depend upon his standing and his business relations with such private parties, but the successful carrying out of all contracts is likewise dependent on this relationship. Friendship counts for much in this world even in business matters. A contractor should always be endeavoring to make friends with those who have construction work to do, or with men who are close associates of such parties.

Friends can be made for these purposes in many ways, through mutual acquaintances, through clubs and fraternal orders, and in other ways, but when once made they must be retained. Under the heading of private parties come private owners, promoters, officials of private corporations, architects, engineers, and bankers. A contentious man will not retain friends. A man must be able to stand up for his rights in an emphatic yet polite manner, but he must consider the other parties and work in harmony with them.

To be successful a man must stick by his business associates and protect their interests as well as his own. One successful contractor has followed this principle throughout his career. He has refused to bring suits regarding any of his contracts, in spite of the fact that he has done construction work throughout the world and is at the head of several companies, and although he has repeatedly been advised to bring suits by his associates. This has made it necessary for him to pocket some losses that were not caused by his own companies, but it has become a great asset to him and he has

made a host of friends for himself and his companies, friends who have supplied him with jobs that have no doubt amply repaid for the losses he has sustained.

The behavior of such men can be held up as an example to all contractors engaged on private work. Fair business dealings will make friends, and the more friends of this kind a contractor has, the more jobs he is likely to obtain. In many cases the contractor does not come into close touch with the owners, as most of his dealings will be with the engineer of the owner.

Relation to the Engineer.

Much has been written of the relationship between contractors and engineers, and many points of contact between the two have been covered in this treatise. Unfortunately, their relations are not always ideal and in some cases each looks upon the other as his natural enemy. It is necessary for the contractor to please the engineer or else his path is likely to be a thorny one. Both contractors and engineers should study to please and assist one another, and to be on friendly terms.

A young engineer will often, through inexperience, place some hardships upon the contractor, but if the latter uses some diplomacy in handling the engineer, such mistakes are not likely to re-occur and the engineer will look to the contractor for advice and support.

When working under an engineer who has either been engaged in contracting or has served as a contractor's engineer, the contractor is not likely to suffer, for the engineer will understand the viewpoint of the contractor and is likely to do his utmost to be fair and considerate. Such engineers know both sides of construction.

The worst trial that a contractor can have is to work under an experienced yet arbitrary engineer, especially one more or less opposed to contractors. Such a man will be considerate of his employer's interests, yet will have little compunction in bringing trouble and possibly ruin upon the contractor. There is little that a contractor can do against such an engineer except to take up his troubles with the owner, if possible. If redress cannot be obtained in this way, he must wait until the job is finished and fight it out. Bad treatment can come from an engineer on public work as well as on private work, but an engineer on public work cannot favor a contractor as much as can one on private work.

Many contracts attempt to make the decision of an engineer final, or make him an arbitrator or referee between the owner and the contractor. Nothing of this kind in a contract can prevent a contractor from taking an engineer's decisions into court. No one can sign away his constitutional rights to bring suit. The engineer or the architect is an employee of one party to the contract; therefore, in a measure, he cannot be a referee or arbitrator between the parties. Such expressions in a contract only signify the desires of the two parties to agree upon some one to interpret the clause of the contract and specifications, and the decisions of the engineer are not binding upon the contractor, but if made according to the written agreement, they are binding upon the owner, whose agent the engineer is.

Relation to Merchants and Manufacturers.

Among the best friends a contractor has are merchants and manufacturers. These, by making long payment sales to contractors, are furnishing thousands of dollars of capital upon which they do business. In addition, many manufacturers maintain expert service and engineering departments to furnish advice to contractors upon plant and methods of carrying on construction work. These things have been invaluable to contractors. Naturally manufacturers have done these things for their own benefit, but nevertheless contractors have likewise received great benefit.

In spite of these things, contractors are not always fair to manufacturers. The latter must submit prices to contractors, upon whom they are dependent for their business and must depend upon being treated fairly. A number of such prices may be submitted to a contractor for his needs in a certain line and the contractor "hawks" these around to obtain lower ones. This may result in lower prices a few times, but as soon as such a man becomes known to the trade, he will never obtain rock bottom prices. Those who submit prices will believe that their prices will be shown to other dealers, so they will name high prices. Then those dealers who may see these prices will not name their lowest prices, but figures that will be just low enough to land the order. When a dealer or manufacturer feels that his prices are to be kept confidential, if he wants the business he will name his lowest prices.

Another way in which manufacturers are treated improperly is

that they are told that they will be given a chance to figure on the contractor's needs, or even asked to submit prices on a given schedule. When the manufacturer returns with them, he is put off indefinitely or told that the contractor's partner has already given the business to a competitor. Such things are wrong. They are not fair, nor good business ethics, and they not only injure others, but also in the end injure those who practice them. A contractor used in this manner by an engineer would feel that he had been mistreated.

Injuries to the Profession.

It is by such behavior that contractors injure their profession. There is no reason why contracting should not be kept as honorable as any other profession. This is dependent upon contractors themselves.

In both volumes of this treatise many different injuries to the profession have been commented upon and in most cases remedies have been suggested. Among these are onerous contracts and specifications, pernicious practices of public works inspectors, legislation passed by the various state governments that affect contractors, grafting on contractors and breeding dishonesty amongst them.

Day Labor Work Versus Contracting.

One of the worst injuries to their profession that contractors are facing is the growing method of doing construction work by the day labor system instead of by contract. By this method contractors are robbed of work, and both the contractors and the public suffer.

It can be stated emphatically as a fact that it is only in exceptional cases that construction can be done cheaper by the day labor method than by contract. It is therefore to the interest of all taxpayers to see that public work be done by contract. The distinction between the two methods is that by the day labor method the director of public works or the engineer hires the men and buys the materials, doing the construction as he sees fit, while by the contract system a contractor hires his own men and purchases the materials, doing the work according to the specifications and under the instructions and supervision of the engineer. The grade of work done by the contract system in most cases is far superior to

that done by the day labor method. Thus the cost of maintenance is reduced and the public obtains more for its money.

Maintenance, as well as construction, should be done by contract. This is especially true of street and road work, as money can and will be saved. Street cleaning can also be done by contract and many cities are now following this method.

Contractors' Associations.

It is to rectify these injurious practices that there is a crying need of contractors' associations all over the country. Each large city and state should have its organization laboring to better conditions in the contracting field. These associations should not be technical societies—we already have enough of these, although methods of carrying on construction can be discussed at meetings if this is desirable—but rather commercial organizations that should look after legislation, protect contractors and fight their battles.

These associations are being formed throughout the country and this is gratifying, but each works only in its own locality. There is need of a national association or bureau that will bind these various local and special organizations together, so that harmony will prevail among them, and all can work together toward one end. It is to be hoped that such a national association can be formed at an early date and that ample funds will be provided for its work.

Contractors as Experts.

If there existed such an organization, then contractors would merit the same consideration from the public and from public officials as engineers are now obtaining. The expert advice of contractors would be asked in regard to public matters, especially those pertaining to construction work. Contractors are competent to pass upon such matters, and in many cases are better fitted to do so than are engineers. Today many contractors are engineers of great ability.

It is a singular fact, that, although several boards of experts were formed by the national government to pass upon many construction features as well as upon the cost of the Panama canal, not once was a contractor placed on these boards as an expert. If there had been, some mistakes made might have been prevented.

Many contractors are also competent to go into court as experts in lawsuits. This is one place in which contractors can assist one another. Their experience certainly qualifies them to pass on certain phases of construction, and courts accept them as being qualified to testify as to material facts, also as to ethics and customs, as well as to answer hypothetical questions.

Contractors Should Stand Together.

All of these things show that it is necessary for contractors to stand together as men do in fraternal orders. There should be a great bond of sympathy among contractors, as well as a financial tie. Every contractor in the United States and Canada should become a member of a contractors' association. If an organization of this kind does not exist in any locality, one should be formed at once and permanent headquarters should be maintained. If a large number of local organizations are formed, it will not be long before these will be bound together into one or two great federations. Then the great mass of contractors will stand together.

APPENDIX A.

BY-LAWS FOR A CONSTRUCTION COMPANY.

ARTICLE I.

Stockholders.

Section 1. Annual Meeting.—A meeting of the stockholders of the Company shall be held annually, at the permanent office of the Company, in the State of, at twelve o'clock, noon, on the third Monday in January in each year, after the year 19.... Should this day fall on a legal holiday, then the meeting shall be held on the next succeeding Monday. This meeting shall be for the election of the members of the Board of Directors, and for the transaction of such business as may be brought before it.

It shall be the duty of the Secretary to notify each stockholder, in a sealed letter, of the time and place of the annual meeting twenty-eight calendar days before the third Monday in January. Nevertheless, a failure to make such notice, or any irregularity in such notice, shall not affect the validity of any annual meeting, or of any proceedings at any such meeting.

Sec. 2. Special Meetings.—Special meetings of the Stockholders may be held at the permanent office of the Company, in the State of, whenever called in writing by a majority vote of the full Board of Directors.

Notice of special meeting, indicating fully the object or objects thereof, must be made in sealed letter to each stockholder, giving the day of the month and the time of convening, by the Secretary, at least five calendar days preceding the day of meeting. Nevertheless, if all the stockholders shall waive notice of a special meeting, no notice of such meeting shall be required; and whenever all the stockholders shall meet—in person or by proxy—such meeting shall be valid for all purposes, without call or notice, and at such meeting any corporate action may be taken.

Sec. 3. Quorum.—At any meeting of the stockholders the holders of two-thirds of all the outstanding shares of the capital stock of the Company, present in person or represented by proxy, shall constitute a quorum of the stockholders for the election of members of the Board of Directors, and for all other transactions or business that may come before it. If the holders of the amount of stock necessary to constitute a quorum shall fail to attend in person or by proxy at the time and place fixed by the by-laws for an annual meeting, or fixed by notice as above provided for a special meeting called by the Directors, a majority in interest of the stockholders present or by proxy may adjourn, from time to time, without notice other than by announcement at the meeting, until holders of the amount of stock requisite to constitute a quorum shall attend. At any such adjourned meeting at which a quorum shall be present any business may be transacted which might have been transacted at the meeting as originally notified.

Sec. 4. Organization.—The President, and in his absence, one of the Vice-Presidents, shall call meetings of the stockholders to order, and shall act as Chairman of such meetings. In the absence of both the President and Vice-Presidents, the Secretary shall call all meetings to order; and then the stockholders shall select a President pro tem to act as Chairman.

The Secretary of the Company shall act as Secretary at all meetings of stockholders; but in the absence of the Secretary at any meeting of the Stockholders, the presiding officer may appoint any person to act as Secretary of the meeting.

Sec. 5. Voting.—At each meeting of the stockholders, every stockholder shall be entitled to vote in person, or by proxy appointed by instrument in writing, subscribed by such stockholder or by his duly authorized attorney, and delivered to the Inspectors at the meeting; and he shall have one vote for each share of stock standing registered in his name at the time of the closing of the transfer books for said meeting.

At each meeting of the stockholders, a full, true, and complete list of all of the stockholders entitled to vote at such meeting, and indicating the number of shares held by each, certified by the Secretary, shall be furnished to the presiding officer and the Inspectors. Only the persons in whose names shares of stock stand on the books of the Company at the time of closing of transfer books for such meeting, as evidenced by the list of stockholders so furnished, shall be entitled to vote in person or by proxy on the shares so standing in their names. The transfer books shall be closed ten calendar days preceding any annual meeting and two calendar days preceding any special meeting.

Prior to any meeting, but subsequent to the time of closing the transfer books for such meeting, any proxy may submit his powers of attorney to the Secretary for examination. The certificate of the Secretary as to the regularity of such powers of attorney, and as to the number of shares held by the persons who severally and respectively executed such powers of attorney, shall be received as prima facie evidence of the number of shares represented by the holders of such powers of attorney for the purpose of establishing the presence of a quorum at such meeting, and of organizing the same, and for all other purposes.

The votes for members of the Board of Directors and, upon demand of any stockholder, the votes upon any question before the meeting, shall be by ballot.

Sec. 6. Inspectors.—At each meeting of the stockholders the presiding officer shall appoint, either before or during the meeting, two inspectors, who shall be duly sworn before a magistrate or a notary public, and whose duties shall be those prescribed in Section 5, and those now to be set forth.

The Inspectors shall receive and take charge of all proxies and ballots, and give report, in writing, on them to the Secretary of the Company, who shall read said report aloud to the stockholders. They shall decide, and their decision shall be final on all points and binding on all stockholders, all questions touching the qualifications of votes and the validity of proxies, and the acceptance or rejection of votes cast. If, for any reason, any of the Inspectors appointed shall fail to attend or refuse or be unable to serve, another Inspector shall be appointed in said Inspector's place in like manner.

Inspectors may or may not be stockholders.

Sec. 7. Order of Business.—As far as consistent with the purpose of the meeting, the following order of business shall be observed:

1. Call to order.
2. Inspectors' report on proxies, etc.
3. Roll call: a quorum being present.
4. Reading of minutes of preceding meeting and action thereon.
5. Report of officers and committees as called by the presiding officer.
6. Election of Directors.

7. Unfinished business.
8. New business.
9. Adjournment.

ARTICLE II.

Board of Directors.

Section 1. Number and Term of Office.—The business and the property of the Company shall be managed by and controlled by the Board of Directors.

The Board of Directors shall consist of ten members, who shall each serve for two years.

In the year 19..., five members shall be elected to serve two years, and five members to serve one year. Thereafter five members shall be elected each year, thus making the Board a perpetual body.

A Director may or may not be a stockholder of the Company. Each Director shall serve for the term for which he shall have been elected, and until his successor shall have been duly chosen.

The Board of Directors may, from time to time, change the number of Directors as they see fit, by amending these by-laws as hereinafter presented. Such increase of directors shall only be made to take effect after an annual meeting of the stockholders, and always half, or as near half as possible, of the Board shall be elected at one time, and the rest the succeeding year.

Sec. 2. Vacancies.—In case of any vacancy occurring in the Board of Directors through death, resignation, disqualification, or other cause, the remaining Directors, by affirmative vote of a majority thereof, may elect a successor to hold office for the unexpired portion of the term of the Director whose place shall be vacant, and until the election of his successor.

Sec. 3. Place of Meeting.—The Board of Directors may hold their meetings, and may have an office and keep books of the Company (except as otherwise may be provided for by law) in such place or places in the State of or outside of the State of as they may determine from time to time.

Sec. 4. Regular Meeting.—Just after the annual meeting of the stockholders of the Company, the Board of Directors shall meet and shall at once proceed to elect and appoint such officers as hereinafter set forth whose term of office shall expire on that day; and transact such other business as they may determine upon. Regular meetings of the Board of Directors shall be held quarterly on the first Monday of every quarter, beginning in the month of January, if not a legal holiday; and if a legal holiday, then on the next succeeding Monday not a legal holiday. No notice shall be required for any such regular quarterly meeting of the Board.

Sec. 5. Special Meetings.—Special meetings of the Board of Directors shall be held whenever called by the President, or by two of the Directors for the time being in office. The Secretary shall give notice of such special meeting by sealed letter at least three calendar days before the meeting, or by telegraphing the same, at least two days before the meeting, to each Director; but such notice may be waived by any Director. At any meeting at which every Director shall be present, even though without notice, any business may be transacted.

Sec. 6. Quorum.—A majority of the Board of Directors shall constitute a quorum for the transaction of business, but if at any meeting of the Board there be less than a quorum present, a majority of those present may adjourn the meeting from time to time. The affirmative vote of at least a majority of all the Directors for the time being in office shall be necessary for the passage of any resolution or election of officers.

Sec. 7. Order of Business.—At the meetings of the Board of Directors, business shall be transacted in such order as from time to time the Board may determine by resolution, except as above provided in Section 4, regarding the election of officers at the regular meeting after the annual meeting of the stockholders, when, after call to order, the first business transacted shall be the election of officers.

At all meetings of the Board of Directors the President, or in his absence one of the Vice-Presidents, or in the absence of all of these officers, the Chairman of the Finance Committee, shall preside.

Sec. 8. Nominating Candidates.—It shall be the duty of the Board of Directors, at their first regular meeting in January, to nominate candidates to fill the vacancies in the Board at the Stockholders' meeting to follow. They shall nominate one man only for each vacancy, and the secretary of the Company shall present these names so nominated to the stockholders at their meeting.

Should any stockholders wish to make nominations to fill such vacancies they must either hold at least one-third of the shares of the capital stock of the Company, or hold proxies properly certified, as set forth in Article I of these by-laws, for at least one-third of the capital stock of the Company.

Sec. 9. Compensation of Directors.—For this attendance at any meeting of the Board of Directors, or of any committee of the Board, every Director shall receive an allowance of ten cents for every mile traveled by him for attendance at each meeting, and also the sum of two dollars for attendance at each meeting. The same mileage allowance shall be made to any officer or employe who, by direction of the Board, shall attend any such meeting. The Finance Committee shall be the judge of mileage allowances that shall be paid under this action.

Sec. 10. Contracts, Etc.—Inasmuch as the Directors of this Company shall be men of large and diversified business interests, and are likely to be connected with other corporations and companies, with which from time to time this Corporation must have business dealings, no contract or other transaction between this Company and any other parties shall be affected by the fact that Directors of this Company are interested in, or are Directors or officers of, such other corporations or members of such other firms, if, at the meeting of the Board of Directors authorizing or confirming such contract or transaction, there shall be present a quorum of Directors not so interested, and any Director individually may be a party to, or may be interested in, any contract or transaction of this Company, provided that such contract or transaction shall be approved or be ratified by the affirmative vote of at least three Directors not so interested.

The Board of Directors in its direction may submit any contract or act for approval or ratification at any meeting of the stockholders called for the purpose of considering any such act or contract; and any contract or act that shall be approved or ratified by the vote of the holders of a majority of the capital stock of the Company, which is represented in person or by proxy at such meeting (provided that a lawful quorum of stockholders be there represented in person or by proxy) shall be as valid and as binding upon the Corporation and upon all the stockholders as though it had been approved or ratified by every stockholder of the Corporation.

The Board of Directors shall have the power to create, make, and issue mortgages, bonds, deeds of trust, trust agreements, and negotiable instruments and securities, secured by mortgage or otherwise, and to do every other act and thing necessary to effectuate the same, and they shall determine who shall be authorized on the Company's

behalf to sign bills, votes, receipts, acceptances, releases, contracts, and all documents.

ARTICLE III.

Finance Committee.

Section 1. The Board of Directors shall elect from the Directors a Finance Committee, and shall designate a Chairman for the Committee, who shall continue to be Chairman of the Committee during the pleasure of the Board of Directors. The Board of Directors shall fill vacancies in the committee by election from the Board of Directors; and at all times it shall be the duty of the Board of Directors to keep the membership of the Committee full.

All action by the Finance Committee shall be reported to the Board of Directors at its meeting next succeeding such action, and shall be subject to such revision or alteration by the Board of Directors; providing that no acts or rights of third parties shall be affected by such revision or alteration.

The Finance Committee shall fix its own rules of proceeding, and shall meet where and as provided by such rules, or by resolution of the Board of Directors; but in every case the presence of a majority shall be necessary to constitute a quorum. In every case the affirmative vote of a majority of all members of the committee shall be necessary to its adoption of any resolution.

The Chairman and each of the members of the Committee shall receive such compensation for their services as from time to time shall be fixed by the Board of Directors.

Sec. 2. The Finance Committee shall consist of three members. So far as practicable each of the members shall be a person of experience in matters of finance or the contracting business. Unless otherwise ordered by the Board of Directors, each member of the Committee shall continue to be a member thereof until the expiration of his term of office as Director.

The Finance Committee shall have special and general charge and control of all financial affairs of the Company. The Treasurer and any assistants he may have, and their representative officers, shall be under the direct control and supervision of the Committee.

The Finance Committee shall have the power to suspend the Treasurer and any employes under him or in his department, acting itself in the place of any person so suspended until the next regular meeting of the Board of Directors, when the Board shall take such action in said suspension as may be deemed necessary.

The Finance Committee shall at least once a year audit the accounts and check over all moneys in the custody of the Treasurer; and they shall have audited, by any officer they may appoint for the purpose, the accounts of any officer or employe of the Company, and shall make annual report of such auditing to the Board of Directors at the first regular meeting in the month of January.

The Finance Committee shall decide at what banking institution the Company's moneys shall be deposited, and shall arrange, through such officers as they may appoint from time to time for the purpose, for such deposits, and shall arrange and control all banking business of the Company.

Sec. 3. During the intervals between the meetings of the Board of Directors, the Finance Committee shall possess and may exercise all powers of the Board of Directors in the management of the financial affairs of the Company, including its purchases of property, and the execution of legal instruments, with or without the Corporate Seal, in such manner as said committee shall deem to be best for the interests

of the Company, in all cases in which specific directions shall not have been given by the Board of Directors.

During the intervals between the meetings of the Finance Committee, and subject to its review, the Chairman thereof shall possess and may exercise any of the powers of the Committee, except as from time to time shall be otherwise provided by resolution of the Board of Directors, or of the Finance Committee.

No stockholder shall become a salaried employe of the Company except by special vote of the Finance Committee, which Committee shall decide the salary to be paid him. Such employe shall be under the authority of the General Manager, unless otherwise ordered by the Board of Directors. He can be dismissed from the service of the Company by a vote of the Finance committee or the Board of Directors.

ARTICLE IV.

Officers.

Section 1. Officers.—The executive officers of the Company shall be a President, two Vice-Presidents, a General Manager, a General Counsel, a Treasurer and a Secretary, all of whom shall be elected by the Board of Directors. The Board of Directors may appoint such other officers as they shall deem necessary, who shall have such authority and shall perform such duties as from time to time may be prescribed by the Board of Directors.

The powers and duties of two officers may be exercised and performed by the same person, whenever it is deemed expedient to do so by the Board of Directors, except that the offices of President and Vice-President shall never be held by the same person; or the offices of President and General Manager shall never be held by the same person. In no case shall a person holding two offices collect double fees, or double mileage for attending a meeting of the Board of Directors.

All officers and agents shall be subject to removal at any time by the affirmative vote of a majority of the whole Board of Directors. All officers, agents and employes, other than the officers appointed by the Board of Directors, or especially provided for in Article IV, Section 2 and 3, shall hold office at the discretion of the General Manager, who shall also fix and determine their compensation. The General Manager shall also have the power to suspend and dismiss from the Company's service all officers, agents and employes, except those elected and appointed by the Board of Directors or by the Finance Committee.

In case of the absence of any officer of the Company, the Board of Directors or the Finance Committee may delegate his power or duties to any other officer or Director for the time being.

Sec. 2. Powers and Duties of the President.—The President shall preside at all meetings of the stockholders, and of the Board of Directors. He shall have general charge of the General Counsel and his department, and shall exercise supervision over the other officers of the Company; but this shall not be construed to mean that he is in actual charge of the other departments.

The President may sign and execute all authorized bonds, contracts, or other obligations in the name of the Company, the Treasurer, or the Secretary, afterwards affixing the seal of the Company to such instruments, and signing with his own name and title. The President with the Secretary or Treasurer shall sign and affix the Seal of the Company to all certificates of the shares of the capital stock of the Company, and any bonds or deeds of trust the Board of Directors may issue.

Annually in January the President shall make a report to the

Board of Directors of all business done during the past year, showing all assets and liabilities of the Company and giving a complete synopsis of the work done by the other officers of the Company, except that of the Finance Committee, which shall report to the Board of Directors through its Chairman. It shall be the duty of the President to present, under his own signature and those of the members of the Board of Directors, a full report of the year's business to the stockholders at their annual meeting.

The President shall be the only officer to make public any records or accounts of the Company, unless the Board of Directors deem it expedient to allow other officers to do so.

Sec. 3. Vice-Presidents.—The Board of Directors may elect two Vice-Presidents, one to be known as First Vice-President, and the other as Second Vice-President. The First Vice-President shall perform the duties of the President when the latter is not able, through sickness, inability, or absence to perform his duties. The Second Vice-President shall be called upon to perform the duties of the President when the President or the First Vice-President is unable to perform them, for the reasons stated in this section. Absence, under this section, shall mean absent from the city of in regard to the ordinary duties of the President, while absence from a meeting shall mean not being present at the meeting-place at the appointed time of such meeting. The Vice-Presidents shall also have such powers and perform such duties as may be assigned to them by the Board of Directors.

Sec. 4. General Manager.—The Board of Directors shall elect a General Manager, who must be a member of the Board.

The General Manager shall be the chief executive officer of the Company and shall have general charge of all business of the Company; including all plants, outfits, quarries, mills, stores, warehouses, employees, contracts, sub-contracts and all property and work of all description, except as provided for in these by-laws in Article III, setting forth the powers and duties of the Finance Committee; and in Article IV, setting forth the duties and powers of the other officers.

The General Manager shall have charge of the purchasing department for all supply, outfits, plants, etc., and shall appoint such purchasing agents as he deems necessary from time to time. All reports from different offices, camps, etc., shall be made to him, and he shall have the power to appoint and employ such agents, clerks, servants, and laborers as he deems necessary to carry on the Company's business.

The General Manager may sign and execute all contracts, sub-contracts, vouchers, bills, checks, acceptances, drafts, and other obligations of the Company, but he cannot sign certificates of stock, bonds, mortgages and other documents, herein specifically provided for in these by-laws. Such contracts, agreements, and other legal instruments as the General Manager may sign, may have affixed to them the seal of the Company by the Treasurer or Secretary, and be properly attested to by their signature and title; but should this not be done, it shall not affect the validity or legality of such documents, unless there should be in existence at the time an act or resolution of the Board of Directors against the execution of such an instrument.

The General Manager shall make an annual report to the President and Board of Directors of all business done by him and under him; and he shall from time to time report to and consult with the Board of Directors, and may ask for legal advice from the General Counsel. It will be expected by the Board that the General Manager and the Finance Committee shall consult with one another and work in perfect accord and harmony for the best interest of the Company.

The Board of Directors shall have the power to suspend the General Manager, and if they deem it necessary for the welfare of the Company they may dismiss him from the Company's service, provided there is an affirmative vote of four-fifths of the full membership of the Board.

The Board of Directors or the Finance Committee shall call upon the General Manager to render to them such reports as from time to time they may decide upon by resolution.

Sec. 5. The General Counsel.—The General Counsel shall be the chief consulting officer of the Company in all legal matters, and subject to the control of the Board of Directors and the Finance Committee; and shall have control of all matters of legal import concerning the Company. He shall report direct to the President, and engage such assistants and attorneys as the President and he may deem necessary.

The General Counsel may or may not be a stockholder.

Sec. 6. Powers and Duties of Treasurer.—The Treasurer shall have custody of all the funds and securities of the Company. When necessary or proper he shall endorse, on behalf of the Company, for collection, checks, notes, vouchers, and other obligations; and shall deposit the same to the credit of the Company in such bank or banks or depository as the Finance Committee may designate. He may sign all receipts and vouchers for payments to the Company either by himself or jointly with such other officers as may be designated by the Finance Committee. He shall sign, with the President or such other person or persons as may be designated for the purpose by the Board of Directors or the Finance Committee, all bills of exchange and promissory notes of the Company; he may sign with the President all certificates of shares of the capital stock or bonds of the Company, affixing to them the seal of the Company.

Whenever required by the Board of Directors or by the Finance Committee, he shall render a statement of his accounts; and upon request of the General Manager he shall render to that official such statements of ledger accounts as may be requested of him.

The Treasurer shall have entered regularly in books of the Company, to be kept under his direction for that purpose, full and accurate account of all moneys received and paid by him on account of the Company. He shall, at all reasonable times, exhibit his books and accounts to any Director of the Company, upon application at the offices of the Company during business hours.

The Treasurer shall pay out no moneys with a check of his own making, except such sums as the Board of Directors or the Finance Committee shall instruct him to do. He shall not honor drafts made upon him unless approved by the Chairman of the Finance Committee. All other moneys to be paid out by him shall be by voucher or check, signed and countersigned by at least two of the three following officers: namely, President, Chairman of the Finance Committee and General Manager. No check shall be signed by two officers in blank.

The Board of Directors or the Finance Committee shall have the power to set aside sums of money, never amounting to more than One Thousand Dollars (\$1,000), upon which any officer or employee that they may appoint may draw check, afterwards rendering an accurate account of such sums to the Treasurer.

The Treasurer shall perform all acts incident to his position, subject to the control of the Board of Directors or the Finance Committee. He may or may not be a stockholder or a member of the Board of Directors. He shall make an annual report in January to the President and the Chairman of the Finance Committee, of all receipts and disbursements and of all moneys and securities in his hands.

The Treasurer may be removed by the Board of Directors, either with or without cause.

Sec. 7. Assistant Treasurers.—The Board of Directors or the Finance Committee may appoint an assistant Treasurer, or more than one Assistant Treasurer. Each Assistant Treasurer shall have such powers and shall perform such duties as may be assigned to him by the Board of Directors or the Finance Committee.

Sec. 8. Powers and Duties of Secretary.—The Secretary shall keep the minutes of all meetings of the Board of Directors, and the minutes of all meetings of the stockholders; and also, unless otherwise directed by the Finance Committee, the minutes of all committees in books provided for that purpose. He shall attend to the giving and serving of all notices of the Company. He may sign with the President or General Manager in the name of the Company, all contracts and other instruments, and shall affix the seal of the Company thereto. He may sign with the President all certificates and bonds of the Company, and affix the seal of the Company thereto.

The Secretary shall have charge of the certificate books, transfer books and stock ledgers; and such other books and papers as the Board of Directors or the Finance Committee may direct, all of which shall, at all reasonable times, be open to the inspection of any Director or stockholder, upon application at the office of the Company during business hours; and he shall perform such other duties as may be assigned to him by the Board of Directors or the Finance Committee.

The Secretary shall have the power to employ assistant Secretaries or other assistants, with the approval of the Board of Directors. He must be a stockholder and a member of the Board of Directors.

Sec. 9. Bond of Officers and Employees.—The Finance Committee shall decide what officers and employees of the Company shall be bonded; the amount of bond to be given; and such bond shall be acceptable to them.

Sec. 10. Compensation of Officers and Employees.—The Board of Directors shall decide what compensation shall be paid to the officers named in these by-laws, except where otherwise provided for. The Finance Committee shall decide upon the compensation of employees in the office of the Secretary and Treasurer. The compensation of all other employees shall be fixed by the General Manager, with the approval of the Finance Committee.

ARTICLE V.

Capital Stock—Seal.

Section 1. Certificates of Shares.—The Certificates of Shares of the capital stock of the Company shall be in such form, not inconsistent with the charter of incorporation, as shall be prepared or be approved by the Board of Directors. The Certificates shall be signed by the President, and also by the Treasurer or Secretary; and the seal of the Company affixed to them.

All certificates shall be consecutively numbered. The name of the person owning the shares represented thereby, with the number of such shares and the date of issue, shall be entered on the Company's books.

No certificates shall be valid unless they be signed by the President and by the Treasurer or Secretary, and the seal of the Company is affixed to them.

All certificates surrendered to the Company shall be canceled, and no new certificates shall be issued until the former certificate for the same number of shares shall have been surrendered and canceled.

Section 2. Loss of Certificate.—Any person claiming a certificate

or evidence of stock to be issued in place of one lost or destroyed, shall make an affidavit or affirmation of that fact, and advertise the same in such newspaper, and for such space of time as the Board may require, describing the certificate; and shall furnish the Company with proof of the publication by the affidavit of the publisher of the newspaper; and shall give the Company a bond of indemnity in form approved by the Board of Directors, with one or more sureties satisfactory to the Board, in double the par value of such certificate; whereupon the President and Secretary may, one month after the termination of the advertisement, issue a new certificate of the same tenor with the one alleged to be lost or destroyed, but always subject to the approval of the Board of Directors.

Sec. 3. *Transfer of Shares.*—Shares of the capital stock of the Company shall be transferred only on the books of the Company, by the holder thereof in person or by his attorney, upon surrender and cancellation of certificates of a like number of shares.

Sec. 4. *Regulations.*—The Board of Directors, and the Finance Committee, also, shall have power and authority to make all such rules and regulations as respectively they may deem expedient concerning the issue, transfer and registration of certificates for shares of the capital stock of the Company.

Sec. 5. *Closing of Transfer Books.*—The stock transfer books shall be closed for the meeting of the stockholders, and for the payment of dividends, during such period as stated in Article I of these by-laws, and as may be fixed from time to time by the Board of Directors or the Finance Committee; and during these periods no stock shall be transferable.

Sec. 6. *Dividends.*—The Board of Directors may declare such dividends from the surplus or net profits of the Company over and above the amounts which from time to time may be fixed by the Board as the amount to be reserved as working capital.

The dates for the declaration of dividends may be those decided upon from time to time by the Board of Directors and the Finance Committee.

Sec. 7. *Working Capital.*—The Directors shall not be required each year, after reserving (over and above) its capital stock paid in as a working capital for this corporation, to declare a dividend among its stockholders of the whole of its accumulated profits exceeding the amount so reserved, and pay the same to stockholders; but the Board of Directors may fix a sum which may be set aside or reserved, over and above the Company's capital paid in, as a working capital for the Company; and from time to time they may increase, diminish, and vary the same in their absolute judgment and discretion.

Sec. 8. *Corporate Seal.*—The Board of Directors shall provide a suitable seal, containing the name of the Company; which seal shall be in charge of the Secretary, if so directed by the Board of Directors and the Finance Committee. A duplicate seal may be kept and used by the President, General Manager and Treasurer. The Board may change the design of the seal at its discretion.

ARTICLE VI.

Amendments.

Section 1. The Board of Directors shall have power to make, amend and repeal the by-laws of the Company, by vote of a majority of all of the Directors, at any regular or special meeting of the Board, provided that notice of intention to make, amend, or repeal the by-laws in whole or in part shall have been given at the next preceding meeting, or without any such notice, by vote of four-fifths of all the Directors.

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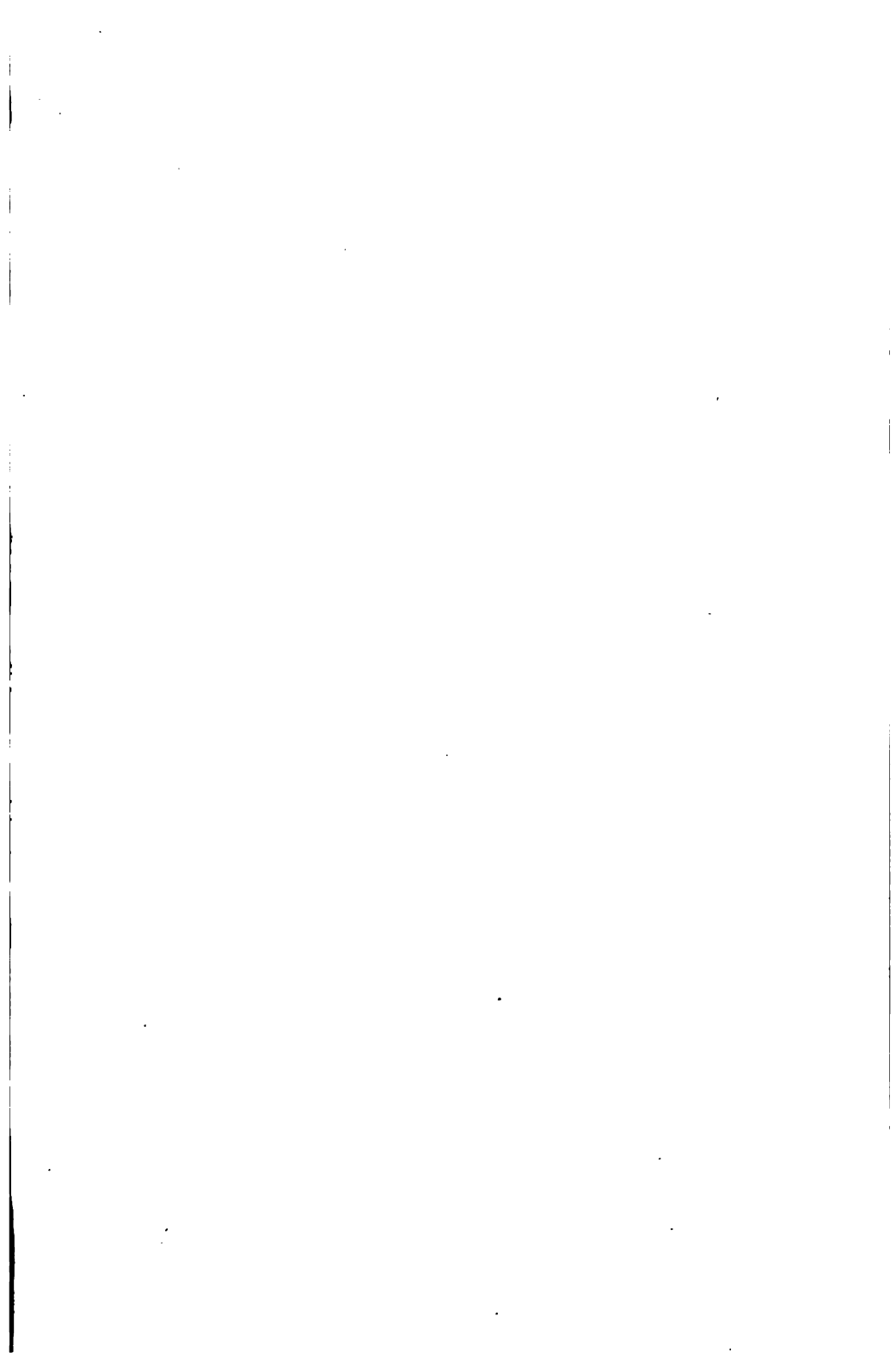
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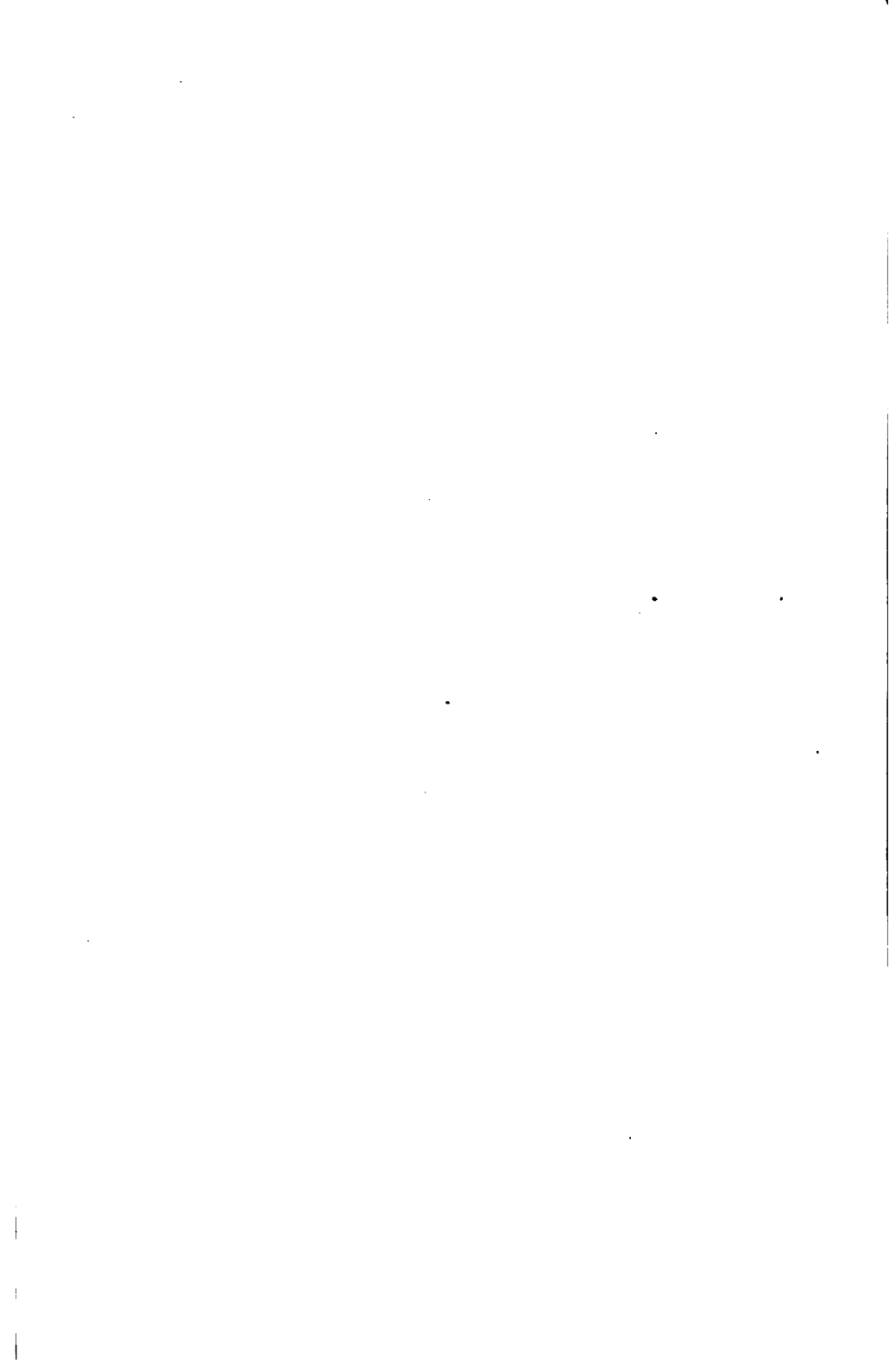
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